K1

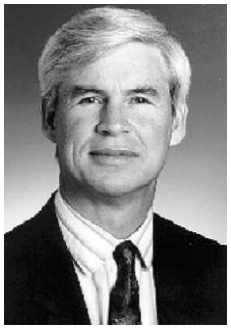
Monday, 09.00am-10.00am Room: Paraninfo-P1

Chair: Esther Ruiz.
Universidad Carlos III, Madrid. Spain.

The Spline GARCH Model for Unconditional Volatility and its Global Macroeconomic Causes

Robert Engle,
New York University. USA

25 years of volatility research has left the macroeconomic environment playing a minor role. This paper proposes modeling equity volatilities as a combination of macroeconomic effects and time series dynamics. High frequency return volatility is specified to be the product of a slow moving deterministic component, represented by an exponential spline, and a unit GARCH. This deterministic component is the unconditional volatility, which is then estimated for nearly 50 countries over various sample periods of daily data.
Unconditional volatility is then modeled as an unbalanced panel with a variety of dependence structures. It is found to vary over time and across countries with high unconditional volatility resulting from high volatility in the macroeconomic factors GDP, inflation and short term interest rate, and with high inflation and slow growth of output. Volatility is higher for emerging markets and for markets with small numbers of listed companies and market capitalization, but also for large economies.
The model allows long horizon forecasts of volatility to depend on macroeconomic developments, and delivers estimates of the volatility to be anticipated in a newly opened market.



Robert Engle, the Michael Armellino Professor of Finance at New York University Stern School of Business, was awarded the 2003 Nobel Prize in Economics for his research on the concept of autoregressive conditional heteroskedasticity (ARCH). He developed this method for statistical modeling of time-varying volatility and demonstrated that these techniques accurately capture the properties of many time series. Much of Professor Engle's research develops time series methods for financial markets. He is the creator of common features, ACD, CAViaR, DCC and coauthor of cointegration with co-prize winner C.W.J. Granger. Before joining NYU Stern in 2000, Professor Engle was Chancellor's Associates Professor and Economics Department Chair at the University of California, San Diego, and Associate Professor of Economics at the Massachusetts Institute of Technology. He is a fellow of the National Academy of Science, the American Academy of Arts and Sciences, the Econometric Society, the American Finance Association and American Statistical Association.

F6

Invited session: Forecasting applications for risk management

Monday 10.15am-11.30am Room: Riancho-P2

Chair: Giampaolo Gabbi
University of Siena, Italy

Absolute VS relative risk measures: An empirical evidence

R. Bramante, L. Santamaría
Institute of Statistics, Università Cattolica del Sacro Cuore

Appropriate risk measures are crucial in evaluating every investment strategy. Portfolio managers asset allocation most widely used techniques typically seek to construct optimal portfolios for different risk levels. There is no single universally accepted risk measure. All the proce-dures available to calculate optimal portfolios lead to different selec-tion decisions from one risk measure to another. Portfolio weights are particularly sensitive to absolute versus relative and to historical ver-sus predictive risk measures. In this paper we give evidence of asset allocation results when dif-ferent risk techniques are adopted specifically when time varying risk measures are used. Furthermore, we describe an application of this methodology to both European and American stock market data.

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Italian Single Stock Futures: impact on stock price volatility

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Three years ago (the 22th of july 2002), Borsa Italiana's Idem market (Italian Derivatives Market) launched trading on single stock futures contracts named Idem Stock Futures (ISF). Single stock futures are derivatives based on individual equity stocks which allow investors and speculators to deal in those stocks more cheaply. As with most derivatives, single stock futures can serve three purposes, all in a finely target way: a) to provide to investors and traders a way of hedging their market exposure; b) to give traders a way of speculating in the financial markets with high leverage; c) to provide a tool for price discovery. The first part of the paper examines the market regulation and the difference between ISF and alternative derivatives (i.e. Iso Alfa, synthetic futures) and so, takes a view about the development of the products on the European markets. The second part of the paper examines whether the introduction of trading in ISF in Italy has impacted on the systematic risk and volatility of the underlying stocks. Two main bodies of theories exist in the literature about the relationship between futures market and underlying spot markets. The first group of studies essentially supports the argument that futures trading destabilises the corresponding cash market by increasing its volatility; the other half of the literature presents arguments in favour of the idea that futures markets have a beneficial effect of the underlying cash markets. To reach our results, we use a GARCH model both for the portfolio composed by the stocks underlying ISF and for the portfolio composed bay a number of stocks very similar in terms of size, volatility, and sector. Our results, based on a time series long six years (three years before and three years after the introduction of ISF), are different respect every under-periods examined.

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Forecasting Gas Demand, Seasonality Effects Through Climate Variables and Weather Derivatives

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The purpose of this study is to analyse the hedging capabilities of weather derivatives on the Italian energy sector. This is achieved through the investigation of the existence of a statistically significant relation between gas consumption and climate parameters. We investigate such a relation applying different models. The first is a simple regression where we estimate gas consumption, as the dependent variable, and temperature, rain, humidity and pressure as explicative variables. In the second model we introduce a derived temperature variable in order to better capture the non linearity behaviour of gas consumption. In the third model we implement lagged, other than present, weather variables. In the second model we introduce a derived temperature variable in order to better capture the non linearity behaviour of gas consumption. In the third model we implement lagged, other than present, weather variables. In the fourth we apply dummy variables to consider, daily, monthly and holiday patterns in gas consumption. In the fifth model, finally, we introduce an autoregressive structure in the error term. We then turn to estimate the cost of weather for a gas retailer operating in Milan and to design alternatives hedging strategies.

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J1

Contributed Session: Judgemental and Scenario Forecasting I

Monday, 10.15am-11.30am Room: Bringas-P3

Chair: Elaine. Deschamps
Washington State Senate, USA

Effects of Emotional State on Probabilistic Forecasts, Confidence in Judgment, and Economic Expectations

F. Bolger, M. Tunstall
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R. Gillett
University of Leicester

The vast majority of research into judgmental aspects of forecasting has been based on the implicit assumption that forecasters are operating in a 'cold' and rational manner, but in practice this may not always be the case. For example, the forecasts of stock traders need to be made quickly and under pressure, and thus may be made as much under the influence of affect as reason. It is also known that salient news events and current weather have an effect on stock trading, implying that mood is influencing trading behaviour, with expectations about future stock movements as an intermediate variable. The same mechanisms may also operate more generally, for instance, with regard to business and consumer optimism.

In an experiment designed to test potential effect of emotional state on probabilistic forecasting, confidence, and expectations, participants were induced into one of four emotional states: two with a positive valence (hope and pride); and two with a negative (anger and fear). Forecasts were then made regarding the likelihood of future events which were either: of a personal or impersonal nature; congruent or non-congruent with the induced emotion; or simple or complex (conjunctions or disjunctions). Next participants answered five questions used to measure consumer confidence. Finally, participants judged which member of each of 20 pairs of major cities has the largest population, then gave their confidence in the correctness of their judgment. Measures of emotional state were also taken as a manipulation check. Initial results show that the manipulation of emotion was largely successful, and that the particular emotion induced had a significant biasing effect on both probabilistic forecasts and consumer expectations.

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A Development and Evaluation on a Prototype-System of the Product Development Scenario-Planning System

Y. Kawamura
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This research shows the plan of the Product Development Scenario-Planning System (PDSPS) and the outline specifications of a developed prototype-system of PDSPS, and considers the evaluation method and results of a developed prototype-system of PDSPS. PDSPS analyzes the product advertisement and consumer public information on the Internet, and simulates the product development scenario, based on the communication semantic chain model (product technology model, consumer behavior model and product development strategy model).

The current scenario-planning technique (mainly using the man power of 30 persons' working group, cross-impact method, and causal map) and this study's scenario-planning (mainly using a developed prototype-system of PDSPS, simulation based on the communication semantic chain model) were compared. The outline results of evaluation are as follows: 1) The working hours for scenario-planning were 25 hours by this study and 157 hours by the current technique. This study brought the shorter planning. 2) The numbers of influence factors extracted were 58 kinds by this study and 48 kinds by the current technique. This study brought the more detailed analysis, 3) This study realized the quantitative analysis of product technological elements and consumer behavior characteristics, in response to the premise conditions. There was not this function in the current technique, 4) his study (the long term scenario simulation using consumer characteristics) brought the rich idea generation of scenario planner.

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Incrementalism and Judgmental Adjustments to Forecasts: Lessons Learned in Budget Forecasting

E. Deschamps
Washington Senate State

This paper highlights the importance of a collaborative workgroup process and judgmental conservatism in budget forecasting. Budget processes rely heavily on accurate expenditure forecasts to predict public demand for major services, from health care, to education, to state prisons. Incrementalism, a predominant approach to policy making and budgeting, involves making a series of minor changes rather than one major policy change. Incremental changes are easier to correct for and less disruptive to the process, and this concept can be also applied to forecasting. This paper examines the forecasting process from a budget writer's perspective, addressing the consequences of over-adjustments to these forecasts and their subsequent corrections. Drawing upon organizational data and experience as former producer and current user of these forecasts, I explore how an incremental approach and the dynamics of a collaborative workgroup process can produce forecasts that are more accurate and ultimately more efficient for the budget process. This paper posits that a collaborative forecast workgroup process will temper drastic changes to the forecast, and breakdowns in the process can pave the way for over-adjustments to the forecast. I analyze real world cases of both conservatism and over-adjustment of forecasts, the workgroup decision-making process in each case, and the implications on the budget process.

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O1

Contributed Session: Applications to control

Monday 10.15am-11.30am Room: Audiencia de la Reina-P4

Chair: Pilar Muñoz
Universidad Politecnica de Cataluña, Barcelona, Spain

Identifying Performance Measure Pattern Changes

S. Garman, W. Gorr, J. Cohen
H. John Heinz III School of Public Policy & Management, Carnegie Mellon University. Pittsburgh.

Monitoring large numbers of quantitative performance measures on a regular basis can be resource intensive if a method for filtering those measures down to the ones in need of review in each period is not used. This research compares the performance of several methods for automatically identifying performance measures that may be exhibiting deviations from their historical pattern including step jumps, changes in the average value of the metric; or spikes, unusually high or low values for the metric. Among the methods compared is Trigg's tracking signal, which was initially used to monitor demand forecasts in inventory control systems. Additionally, we tune the parameters of these methods to approximate the judgment of individuals responsible for monitoring the measures. Specifically, we analyze crime frequency data and we use the judgment of three crime analysts from the Pittsburgh police department to train and evaluate the methods. The score from a cross validation procedure forms the basis for performance comparisons among the techniques and we find that the two best performing methods make use of the errors of a simple exponential smoothing forecast.

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Control charts for monitoring autocorrelated processes based on transfer function and neural networks models.

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P. M. Marques Rodrigues
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Statistical process control can have different objectives and can be done in different forms (Hawkins, et al, 2003). Currently, considerable attention has been given to the effect of data correlation on the statistical process control (SPC). The use of traditional SPC methods when observations are correlated often leads to misleading conclusions as to whether or not the process is under control. This paper presents the construction of residual based control charts, obtained from Transfer Function and Neural Network models, to monitor the mean and dispersion in autocorrelated productive processes. One application with real data and a performance comparison of the residual control charts obtained from the Transfer FunctionArtificial Neural Network models with that of traditional control charts X(bar) and R presented. It is established that the former procedure is more efficient in detecting changes in the mean and dispersion of the process than the latter.

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Traffic data analysis and forecasting

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Suitable traffic management strategies essentially depend on the quality and reliability of the collected traffic data therefore prior to its use in the decision making process is essential a careful analysis and filtering of the raw data available. Typical data traffic sets consist namely of volumes, speeds and occupancies aggregated for specific time periods depending on the intended use. In some cases further data like space headways, traffic composition and others could also be available. This paper addresses the research undertook to develop methods and models for a systematic analusis and assessment of the quality of traffic data regarding its application to traffic management systems. The research, done on behalf of the Catalan Traffic Service (CTS), has been based on a rich traffic data base of the measures provided by the traffic data detection and measurement system of the primary motorway network in the metropolitan area of Barcelona. The data collectionsystem is based on detection stations with detection capabilities per line on each direction. The detectors provide every minute, among others, measures of the following variables: traffic volume, vehicles average speed, percentage occupation time, traffic composition and mean space headway between vehicles.
A preliminary analysis explores models for minute-to-minute traffic flows, taking into account time of the day and day of the week. On basis to the results of this analysis a set of traffic indicators have been proposed to assist traffic operators in their decisions on the control and management strategies to use in each case, based on the identified situation, in order to solve, or to alleviate at least, the traffic idenfied problems. A key component of the decision making process is the short term forecasting of the traffic inidcators. Short term forecasting is conducted by ad hoc traffic models which are presented and discussed in this paper.

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FA1

Contributed Session: New forecasting algorithms

Monday, 10.15am-11.30am Room: Santo Mauro-P5

Chair: Rob J Hyndman
Monash University, Melbourne, Australia

Quantifying the quality of macroeconomic variables

A. Tererukosky, L-E. Öller
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Methods to quantify the quality of a macroeconomic statistical time series are presented. The measures are based on a combination of how predictable the series is and how much its statistics needs to be revised. An ``information window'' based on signal-to-noise ratios (SNR) provides a snapshot of the quality. A formulation of information in terms of entropy is considered. Our nonparametric approach is an attractive alternative to the parametric entropy estimation suggested by Theil, since it allows for testing whether a forecast or a preliminary value is informative. Concavity and monotonous convergence of information accrual are discussed. Finally, we show how the suggested measures signal that either a given forecast or the macroeconomic variable itself, is of dubious quality.

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Nonlinear forecastability tests: A Monte Carlo comparison

J. Belaire-Franch, D. Contreras
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In this paper, we study the small sample properties of two nonlinear forecastability tests: the Fernandez and Sosvilla (FS, 1998) and Finkenstadt and Kuhbier (FK, 1995) tests. Using alternative surrogate data generating methods and bootstrap techniques, results are favourable to the use of the FK test. The methods are illustrated by the analysis of the Irish stock market returns.

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A new algorithm for automatic ARIMA forecasting

Y. Khandakar, Rob J Hyndman
Monash University, Melbourne, Australia

A common obstacle in using Autoregressive Integrated Moving Average (ARIMA) models for forecasting is that order selection depends on subjective choices that require some expertise. On the other hand, objective order selection using information criteria aims to identify the 'correct' order rather than a good forecasting model. We propose a new algorithm where the aim is to 'select the model that produces the best forecast' rather than 'calculate forecasts from the best model. In the first step of our algorithm, an estimate of the unobserved error component of a time series is obtained assuming the data are from some ARIMA model of unspecified order. In the second step, candidate ARIMA models of various orders are fitted using updating regressions based on the historical data and estimated errors. A Kalman filter is used with the fitting period increasing incrementally. Each candidate model is used to calculate multi-step ahead forecasts which are compared with the data beyond the fitting periods. The best ARIMA model is selected for a given forecast horizon by averaging a prediction error measure over the forecasts at that horizon. Finally the selected model is re-estimated using maximum likelihood estimation.
We show that the algorithm works well for non-seasonal series, and we compare it with alternative approaches including the AIC and BIC. We also show that the algorithm can be extended to include seasonal models.

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EN1

Contributed Session: Energy I

Monday, 10.15am-11.30am Room: Infantes P6

Chair: Reinaldo de Castro Souza,
Puc Rio de Janeiro, Brasil

Electricity markets forecasting based on frequency domain methods

D. J. Pedregal, J.R. Trapero
Universidad Castilla-La Mancha, Ciudad Real, Spain

The changes experienced by electricity markets in recent years have created the necessity for more accurate forecast tools of electricity prices and load demand, both for producers and consumers. Many methodologies have been applied to this aim and there have been a tendency to sophistication in the analysis. However, from time to time claims appear in the open literature that simple (often rather classical) models perform better than sophisticated ones. In the view of the authors, Unobserved Components Models (UC) are not yet fully exploited, though there have been some applications to electricity markets. Such applications have been produced always to electricity load demand and with an especial emphasis on model dimension reduction, in order to avoid the complications of time domain methods applied to big models necessary for rapidly sampled data (i.e. hourly). The present paper argues that such difficulties may be overcome within the UC framework by means of frequency domain identification and estimation methods. Two of such methods are explored, one heuristic and a second more formal. The heuristic one consists of fitting the model spectrum to the empirical spectrum of a signal in a non-linear least squares sense. The formal method consists of using Maximum Likelihood in the frequency domain for the stationary form of the model.

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A Statistical Model of Natural Gas Standardized Load Profiles

M. Brabec, O. Konar, M. Maly, E. Pelikan, J. Vondracek
Institute of Computer Science, Prague 8, Czech Republic

We will present a statistical model developed for construction and application of standardized load profiles (SLP). SLP curves (which are in the model's core) give a typical natural gas consumption pattern throughout a year in various time resolutions (daily, hourly). Main motivation for SLP employment comes from the need to model and forecast gas consumption in various customer pool segments in both shorter and longer time horizons, using only relatively small amount of individual information (which is typically available in routine customer databases) plus external variables correcting for time-varying details. Our model was constructed as a semi-parametric regression model which uses three types of information: i) constant characteristics of an individual customer, ii) consumption history for an individual customer, iii) time-varying variables used to describe typical trend or to correct for current conditions. Having multiplicative structure, the SLP model allows for convenient separation of individual-specific but time-constant info (i, ii), and a common but time-varying core SLP curves with adjustments (iii). While corrections for current and one-day lagged temperature as well as for various calendar effects are parametric, no substantial a priori information about the typical consumption trend within a year (and/or within a day) is available, so that these trends are modeled non-parametrically. Such a structure is useful for dealing with various data irregularities in the training sample. Substantial constant customer characteristics (like the type of gas appliances, technological/non-technological gas use, etc.) determine allocation of a customer into a segment. The model is then stratified by segments, effectively. In addition to the description of model structure and illustration on real data, we will mention various technical details that had to be dealt with during model development, e.g. substantial heteroscedasticity remaining even after the data transformation. (The work is supported by the Grant Agency of the AS CR, grant 1ET400300513.)

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A Smooth transition periodical autoregressive time series model for short term electricity load forecast

L. Amaral, R. Castro Souza
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M. Stevenson
Sydney University

The paper considers a non linear approach to obtain short term forecast for electricity load. The model combines a smooth transition autoregressive process with a periodic autoregressive time series model, creating the so called Smooth Transition Periodical Autoregressive (STPAR). A model building procedure is developed with simple statistical methods and a linearity test against smooth transition periodical auto regressive. Estimation by nonlinear least squares is considered. A Monte Carlo experiment was implemented to evaluate the performance of the proposed test and the estimation algorithm. Finally, load data from New South Wales State in Australia electricity market was used as a real example. Other models were used to compare the performance of such model.

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EC7

Invited Session: Recent Developments in Macroeconomic Forecasting

Monday, 10.15am-11.30am Room: Biblioteca-P7

Chair: David F. Hendry
Oxford University, England

Macroeconomic Forecasting with Mixed Frequency Data

M. Clements, A. B. Galvao
Warwick University, Coventry, England

Although many macroeconomic series such as US real output growth are sampled quarterly, many potentially useful predictors are observed at a higher frequency. We look at whether a recently developed mixed data-frequencysampling (MIDAS) approach can improve forecasts of output growth. We carry out a number of related real-time forecast comparisons using coincident and leading indicators as explanatory variables. We are able to show that MIDAS model forecasts are markedly more accurate at horizons of less than one quarter using coincident indicator information, and that MIDAS models may bean effective way of combining information in modelling when there are arange of potentially relevant explanatory factors.

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Forecasting UK Inflation: Empirical Evidence on Robust Forecasting Devices

J. Castle, D. F. Hendry
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Forecasting inflation is fundamental to UK monetary policy, both for policy-makers and private agents. However, forecast failure is prevalent, with naive devices often outperforming the dominant congruent in-sample model in forecasting competitions. This paper assesses evidence for UK annual and quarterly inflation using the theoretical framework developed by Clements and Hendry (1998, 1999) to explain the empirical findings. We build both single equation and vector equilibrium-correction models of inflation using the automatic model selection algorithm, PcGets, and use these models along with various transformations of the models to forecast UK inflation over the period 1998-2003. Robust forecasting devices do prove useful in forecasting macroeconomic time series and they often outperform econometric models, both when there are structural breaks in the data and when the underlying process appears to be stable but with breaks in the explanatory variables. Increasing the information set does lead to improvements in forecasting performance suggesting that disaggregation can yield benefits. Finally, it is observed that much of the forecast error in the structural models is driven by the deterministic terms. Breaks in the mean of the cointegrating vector or the growth rate of the system will cause forecast failure and results show how sensitive forecasts are to errors in these terms.

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Robustifying Forecasts from Equilibrium-correction Systems

D.F. Hendry
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Cointegration analysis has led to equilibrium-correction econometric systems being ubiquitous. But in a non-stationary world subject to structural breaks, where model and mechanism differ, equilibrium-correction models are a risky device from which to forecast. Equilibrium shifts entail systematic forecast failure, as forecasts will tend to move in the opposite direction to data. We explain the empirical success of second-differenced devices and of model transformations based on additional differencing as reducing forecast-error biases, at some cost in increased forecasterror variances. The analysis is illustrated by an empirical application to narrow money holdings in the UK.

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TS2

Contributed Session: Methodology II

Monday, 10.15am-11.30am Room: C-1

Chair: Keith Ord
Georgetown University, Washington, DC

Generalizations of the Box-Jenkin's Airline Model with Frequency-Specific Seasonal Coefficients and a Generalization of Akaike's MAIC

D.F. Findley, T.S. McElroy, K.C. Wills, D.E. Martin, K. Wills
U. S. Census Bureau, Washington, DC

J.A. Aston
Academia Sinica, Taipei

The Box-Jenkins “airline” model is the most widely used ARIMA time series model for seasonal economic time series. It uses a single seasonal moving average coefficient, in conjunction with the seasonal sum factor of the seasonal differencing operation, to account for seasonal effects. We consider generalizations which have two coefficients for the seasonal moving average factor associated with the seasonal frequencies 1, 2, 3, 4, 5 and 6 cycles per year (in the case of monthly data). Each new model is defined by partition of these six frequencies into two complementary subsets, with each subset having its own coefficient. Consequently, we can, for example, appropriately model a series whose seasonal component is strong at only one seasonal frequency and weak at the rest, which the airline model cannot. For automatic model selection among partitions of a given type, for example, partitions defined by complementary subsets with one and five frequencies, a generalization of Akaike's Minimum AIC model selection criterion is presented to account for the effect of the multiplicity of models compared. From a study of 75 Census Bureau series for which an airline model had previously been chosen, we present comparisons of model-based seasonal adjustment filters and seasonal adjustments and of out-of-sample forecast performance relative to the airline model for generalized models preferred by this criterion.

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Parametric and nonparametric tests for comparison of time series with unequal sample sizes

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N. Crato
Cemapre and ISEG/Technical University of Lisbon

D. Peña
Universidad Carlos III de Madrid

The classification and clustering analysis of time series has useful applications in several fields. In Forecasting, we may be interested in identifying similarities in time series behaviour to choose appropriate prediction methods. The comparison of time series has been studied in literature using both time and frequency domain methods. However, existing spectral methods for discrimination and clustering analysis of time series cannot be applied directly to series with unequal lengths. A periodogram-based metric for classification of time series has been proposed. We now extend this method for classifying time series with unequal lengths. We also develop parametric and nonparametric tests do determine whether two series have the same generating process.

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Prediction Intervals from Misspecified Models

K. Ord
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P. Gould
Monash University

It is well-known that as the forecasting horizon lengthens, the forecast mean square error (FMSE) increases. Similar results are difficult to prove in general terms for other error measures, but may readily be demonstrated empirically. However, empirical results in the M-Competition (for the mean absolute percentage error or MAPE) and in the M3-Competition (for the symmetric MAPE) show that the forecasting performance is better at lag 12 for monthly data than at some intermediate lags. Other empirical results verify this conclusion. We first demonstrate that such empirical regularities are entirely reasonable, once the possibility of model misspecification is admitted. We then show that h-step-ahead forecasts may be improved by using methods that are calibrated by fitting to h-step-ahead errors.

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EC8

Invited Session: Macroeconomic Forecasting II

Monday, 10.15am-11.30am Room: C-2

Chair: Herman Stekler
George Washington University, Washington DC USA

Forecast errors and the macroeconomy - a non-linear relationship?

U. Fritsche, J. Döpke
University Hamburg, DIW Berlin, Germany

The paper analyses reasons for departures from strong rationality of growth and inflation forecasts based on annual observations from 1963 to 2004. We rely on forecasts from the joint forecast of the so-called 'six leading' forecasting institutions in Germany and argue that violations of the rationality hypothesis are due to relatively few large forecast errors. These large errors are shown - based on evidence from probit models - to correlate with macroeconomic fundamentals, especially on mone-tary factors. We test for a non-linear relation between forecast errors and macroeco-nomic fundamentals and find evidence for such a non-linearity for inflation forecasts.

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Who dominates and who wins joint forecasts? Results from the German joint diagnosis

U. Heilemann, G. Quaas
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Twice a year six major German economic research institutes present a jointly produced forecast of the main macroeconomic variables for the next 12/18 months (“Joint Diagnosis” (GD)). This paper examines for the period 1981 to 1994 whether any of the contributing institutes is dominating this process and for how long. It is also examined whether this holds for one or for more variables and how consistent this dominance is. We analyze the deviation of the institutes' own forecasts from the joint forecasts they agree with after an intensive discussion and negotiation process. In a second step we compare the deviations of the individual forecasts from actual data to identify the winner. The studies use a number of statistical and econometric techniques to identify the various leaders. It will turn out that the best forecasters are not necessarily the most influential among the members of the JD.

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Joint Evaluation of Federal Reserve Forecasts

Herman Stekler, Lindsay Kitzinger
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There have been many evaluations of economic forecasts, but most of these studies have analyzed the forecasts for real growth and inflation separately. This paper presents a method for evaluating these variables jointly. This procedure is then applied to the forecasts of the staff of the Board of Governors of the Federal Reserve System. The method is an expansion of the technique that was developed earlier to determine whether a set of forecasts is useful and is a relatively easy way to jointly assess forecasts of different variables made by the same forecaster. The results show that the Federal Reserve forecasts , while not necessarily separately valuable, are jointly valuable at all leads.

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FM1

Contributed Session: Improvements in forecasting I

Monday, 10.15am-11.30am Room: C-3

Chair: Md. A. Aziz Hayat
Monash University, Melbourne

Frequency domain approach for time series forecasting with state space model criteria

O. Antropov, A. Akhmetshin
Dniepropetrovsk National University, Dnipropetrovsk

This paper states the theoretical basis and illustrates practical implementation of a new frequency domain approach in time series extrapolation, taking into account the underlying dynamics of systems that generate observed time series. The nature of predicted data is considered by usage of special criteria for the length of taken datasets, based on phase space model. Such model is implemented by recurrence plots method, which gives an opportunity to estimate the predictability of observed time series via the determinism of the system. Determinism rate of probably nonstationary time series is analyzed with consideration of chaos-chaos transactions via recurrence plots method technique, adopted from nonlinear system dynamics theory. The forecasting ability and fundamentals of proposed method are compared to that of univariate unobserved component model. Simulation study of method's performance as well as application to real example is provided. Technique can be of help when dealing with short nonstationary series with strong seasonality, when high resolution in terms of hidden harmonic components is needed. Among obvious examples of possible application are seasonal adjustment, trend and cycle estimation.

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Identifying Optimal Dynamic Forecasting Models through Akram Test Statistic

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A. M. Chaudhry
University of Bahrain, Kingdom of Bahrain

In real life situations, the assumption of whiteness of residuals is found to be rarely true as the data are highly polluted with colored noise processes. Thus, it becomes imperative to identify the noise processes before the conduct of any formal analysis for forecasting purposes and only then models having capability of filtering the color of noise be constructed to generate results with residuals having whiteness in their structures. In this study, a computer software based on Kalman filtering algorithm has been developed to obtain dynamic forecasts. The optimality is ensured through Akram Test Statistic (ATS), which is non-parametric in nature and not only identifies the presence of color in a very simple way but also determines its type and order quite effectively for both classical static as well as dynamic models. The results are supported by comparing with the Akaike's and Bayesian information criteria plus Durbin-Watson Test Statistic. To analyze the adequacy of forecasts, various popular forecast accuracy measures have also been computed.

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Forecasting with deseasonalizing and reseasonalizing

Md. A. Aziz Hayat, R. J. Hyndman
Monash University, Melbourne

Seasonal data is often forecast by first deseasonalizing (e.g., using X-12-ARIMA), then forecasting the seasonally adjusted data, then reseasonalizing the forecasts using the most recent seasonal factors. However, this procedure ignores dynamic changes in the seasonal pattern. We propose a new approach by treating the seasonal factors as functional data. This enables us to forecast the seasonal factors and include the seasonal variability in prediction intervals. The seasonal 'functions' are estimated using principal component decomposition and then forecast using univariate techniques. These seasonal functional forecasts are then used in reseasonalizing the forecasts of the seasonally adjusted data. We find that for data with rapidly changing seasonal patterns, forecast accuracy improves using this method compared to the standard approach of reseasonalizing using the seasonal factors of the last year. For data with relatively stable seasonal patterns, our method gives the same results as the conventional reseasonalizing method. For all data, our method gives more realistic prediction intervals by including variation in the seasonal component.

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FS1

Featured Talk

Monday, 12.00am-01.15pm Room: Riancho-P2

Chair: Gabriel Pérez-Quirós
Presidencia del Gobierno, Madrid. Spain

Forecasting using a large number of predictors

Lucrezia Reichlin
European Central Bank and CEPR

During my talk, I will explore and compare alternative methods for forecasting macroeconomic data using a large number of predictors, using a Bayesian regression with normal and double-exponential priors as forecasting methods on large panels of time series. We consider alternative methodologies: factor model forecasts, pooling forecasts from a large number of small scale models and penalized regression forecasts. Empirically, these forecasts are highly correlated with principal components forecasts and they perform equally well for a wide range of prior choices. Later, we compare the empirical performance of the alternative models in a simulated out-of-sample exercise.

Finally, we provide a general framework to interpret all the proposed methodologies when the time series in the panel are characterized by strong co-movements.

Lucrezia Reichlin has been Director General of Research at the European Central Bank since March 2005. She is Professor of Economics at ECARES, Université Libre de Bruxelles, currently on leave. She holds a Ph.D. from New York University (1986) and previously worked at the OFCE in Paris, the Graduate School of Business at Columbia University and at the European University Institute. She has been CEPR program coodirector for International Economics from 1999 to 2004, Scientist in charge for the Euro Area Business Cycle Network up to March 2005, Member of the Council of the European Economic Association. She currently has a number of professional responsabilities, amongst which being Co-editor of the NBER-International Symposium in Open Macroeconomics (ISOM) and serving in the editorial board of the Journal of the European Economic Association.

Her research is in the field of applied macroeconomics and time series. She has contributed in developing models for signal extraction and forecasting key economic indicators from large panels of time series. She has also worked on problems of structural identification in VAR and related models. These techniques have been widely applied in central banks around the world.

F5

Invited Session: Forecasting in equity markets

Monday, 12.00am-01.15am Room: Bringas-P3

Chair: Giampaolo Gabbi,
University of Siena, Italy

Market characteristics and chaos dynamics in stock markets: an international comparison

G. Mattarocci
University of Rome Tor Vergata, Rome, Italy

Chaos theory assumes that return dynamics are not normally distributed and it is necessary to use more complex approach to study these time series. Fractal Market Hypothesis, in fact, assumes that returns' dynamics is not independent from investor attitudes and represent the result of the interaction of traders that, frequently, adopt different investment styles. Studies proposed in literature try to identify the best approach to define the fractal dimension using, in particular, data of high developed financial markets where is available a more complete set of information and the price determination mechanism is more efficient. One critique of these approaches is that results obtained don't allow to identify the relationship between fractal dimension and market characteristics and which aspects are more relevant in the definition of fractal market dimension. In fact, previous studies analysed market liquidity for a low number of countries and all the other aspects related to market transactions are not considered. Using a large sample of world stock indexes, I try to identify which are main market characteristics that influence return dynamics. The study is released using the Rescaled Range Analysis (R/S) approach and points out that markets characteristic, like liquidity, type of admissible orders and so on, influence R/S capability to study return dynamics.

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We can forecast small caps pricing through fundamentals? Findings on the Italian stock market

C. Zara
Università L. Bocconi, Milan, Italy

The research target is to explore the relation between the fundamentals and the market pricing for SME which have floated in the Italian stock market in the period 1994 - 2000. The fundamentals considered are company performance, corporate governance structure and shareholders typology. The single share market valuation is measured as its underperformance or outperformance compared with the general market trend expressed by a suitable index. Empirical evidence shows that Italian stock market has basically a bias against SME IPOs because it is very good in valuation of the majority of companies with poor fundamentals but at the same time, it excessively penalised the companies with strong fundamentals.

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Small Caps vs. Large Caps: a comparison based on the impact of market news

C. Boido,
University of Siena, Siena, Italy

Antonio Fasano
University of Salerno, Italy

In this paper we deal with a comparative analysis of small caps and large caps market behaviour on the basis of their reactions to news events. In the first part of the paper we review meaningful researches on the subject, concerning investor's rationality and his/her attitude to incoming market news. In the second part we try to model news impactdistinguishing between small and large caps. The analysis is based on market trends for a sample of small and large cap stocks, given a timeseries of news events affecting them.Every piece of news is here considered as is, disregarding of anyinterpretation, in particular no distinction is posed between good and bad news.

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TO1

Contributed session: Tourism

Monday, 12.00am-01.15am Room: Audiencia de la Reina-P4

Chair: L. J. A. Lenten
La Trobe University, Melbourne

Forecasting the hotel trade in Spain

I.Fernandez, R. Pino, J. Puente, N. Garcia
University of Oviedo, Gijón, Spain

With a turnover that rises by the year, tourism is one of Spain's biggest money money-spinners. Last year, this sector accounted for over 9% of Spain's GNP. In 1998, for the first time in its history, Spain rose to second position, behind France, in the world ranking of holiday destinations. The prolific number of studies on tourist sector in Spain therefore comes as no surprise. These studies provide data on such things as the number of tourists, income from the tourist trade, types of accommodation, average length of holiday stay or the total number of overnight hotel stays, as well as forecasting different series for the industry. In this job, three time series from the hotel trade are analyzed: 1. Occupancy level, 2. Staff employed, and 3. Total number of open hotels. Data are collected from the tempus database at the Spain's National Statistics Institute website. These series are composed of 144 monthly data ranging from January 1993 to December 2004. Monthly data up to December 2003 are modelled to obtain forecasts for the period January 2004 December 2004, so that they can be compared to actual data. Two well-known methods are used to obtain forecasts: Box-Jenkins ARIMA models and Artificial Neural Networks. Forecasting performance is measured in terms of MAPE (Mean Absolute Percentage Error), so that both forecasting methods can be compared. Forecasts are calculated one year ahead, because tourist industry companies need to know, well in advance, the future behaviour of the sector in order to undertake strategic planning.

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Tourism forecasting: to combine or not to combine?

H. Song
The Hong Kong Polytechnic University, Kowloon, Hong Kong

Existing literature shows that forecast combination can improve forecasting accuracy. This study tests this proposition in the tourism context by examining the efficiency of combining forecasts based on three different combination methods. The data used for this study relate to tourist arrivals in Hong Kong from the top ten tourism generating countries/regions. The forecasts are derived from four different forecasting models: integrated autoregressive moving average (ARIMA) model, autoregressive distributed lag model (ADLM), error correction model (ECM) and vector autoregressive (VAR) model. All forecasts are ex post and the empirical results show that although the combined forecasts do not always outperform the best single model forecasts, almost all the combined forecasts are not outperformed by the worst single model forecasts. This suggests that forecast combination can considerably reduce the risk of forecasting failure. This conclusion also implies that combined forecasts are likely to be preferred to single model forecasts in practice.

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The Effect of Henderson-Trending on the Forecasting Accuracy of Aggregate Australian Tourism Figures

L. J. A. Lenten,
La Trobe University, Melbourne

The forecasting accuracy of key aggregate Australian tourism figures (namely total visitor arrivals and resident departures) is investigated, using a structural time-series model based on the Kalman filter. Specifically of importance is whether the Henderson Moving Average procedure used by the Australian Bureau of Statistics (ABS) to generate 'trended' series, distorts the underlying time-series properties of the data for forecasting purposes. Since the ABS regularly publishes both seasonally adjusted and trended data along with the original series for many variables, this is an issue of utmost importance. However, given the weight of attention in the literature to the seasonal adjustment processes used by various statistical agencies, it appears that 'trending' procedures have received somewhat less attention, which this study hopes to address. An unobserved components model is utilised to generate out-of-sample forecasts for both variables, using both the trended and the 'plain' seasonally adjusted series. The forecasts are then made comparable by building the trended factors into the seasonally adjusted series. Forecasting accuracy is measured by a suite of common methods, and a test of significance of difference is applied to the respective Root Mean Squared Errors (RMSEs). It is found that the Henderson Moving Average procedure applied by the ABS does not lead to deterioration (if anything, there is a significant improvement) in forecasting accuracy in Australian tourism aggregates.

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TL1

Contributed session: Telecom I

Monday, 12.00am-01.15am Room: Infantes-P6

Chair: Carlo Hjelkrem
Telenor Nordic, Fixed, Snarøya

Diffusion of mobile terminal market: A model considering repeat-purchase

C. Lee, Jongsu Lee
Techno-Economics and Policy Program, Seoul National University , Korea(South), Seoul

The purpose of this study is to suggest new repeat purchase diffusion model at the brand level to overcome limitations of the previous repeat purchase diffusion models. This study consists of three analyses which (1) separately identify diffusions of first-time purchasers and repeat purchasers, (2) reflect competitive factors of brand to affect diffusion of product into our model, (3) and observe diffusion patterns considering replacement cycle of consumers. This paper applies our model to the mobile terminal market in Korea. The results show that the growth rate of repeat purchasers is faster than that of first-time purchasers. In addition, bandwagon effect and high functionality of product have significant impact upon diffusion of repeat purchasers. Finally, in comparison with other repeat purchase diffusion model, our model shows good performance in terms of model fitting and model forecasting. Our repeat purchase diffusion model may be useful in that it enables the description of complicated environments and provides the flexibility to include marketing mix variables in the regression analysis.

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Forecasting residential broadband demand by integrating qualitative aspects into quantitative forecasting techniques

C. Hjelkrem
Telenor Nordic, Fixed, Snarøya

Little or no historical information is often the case when new technology is introduced. Thus, forecasts will face a great deal of uncertainty. In such cases traditional quantitative forecasting models such as time series models and regression models are left in favour of e.g. scenario techniques and analogies. Diffusion models represent a group of quantitative forecasting models that requires little data. However, such models describe a synthesis of supply and demand, and cannot answer questions like what happens to demand when supply is increased. The model presented is an attempt to bridge the gap between supply and demand, through a simple mechanism. The demand side is described by quantitative representations of several qualitative aspects of broadband demand, while supply is represented by deployment. The Norwegian broadband market is segmented into 7 sub segments. Each segment addresses different combinations of broadband technologies, such as VDSL (Very-high-data-rate Digital Subscriber Line), HFC (Hybrid Fiber Coax, i.e. cable TV and internet modems), LMDS (Local Multipoint Distribution System, i.e. wireless local loop) and DTH/SMATV (Direct To Home/Satellite Master Antenna Television, i.e. Satellite access). The segments are constructed combining three different variables: population density, technologies available and major operators present. Here, the lower the population density, the fewer technologies available and the poorer the supply.

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NN5

Contributed session: Neural Nets Applications I

Monday, 12.00am-01.15am Room: Biblioteca-P7

Chair: Wilpen Gorr
Carnegie Mellon University, USA

Designs of neural networks to forecast short-term railway passenger demand

T. Tsai, Chi-Kang Lee, Chien-Hung Wei
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This study designs two neural network structures for daily passenegr demand forecasting in railway transportation. Feature extraction shows that data has features both from short-term memory and long-term memory. Multiple temporal unit neural network (MTUNN) is first desinged to deal with features from different sources of memory within a network structure. The idea behind MTUNN is information should be rendered at right place. Mix of information at inappropriate place may result in unsatisfactory performance. However, a lot of training samples are included in order to cover information from short-term memory and long-term memory in MTUNN. This situation may lead to use too many redundant samples and harm adaptability. In order to solve the problem, parallel ensemble neural network (PENN) is proposed to obtain information from different sources of memory and also use training samples smartly. The idea behind PENN is short-term memory and long-term memory should be treated respectively in two individual models. It is because short-term memory is more suitable to be observed from disaggregated data, such as daily. Long-term memory is more suitable to be observed from aggregated data, such as monthly data. In addition, conventional Back-propagation Neural Network (BPNN) is also constructed to validate the value of above two ideas. An empirical study is implemented to demonstrate whether MTUNN and PENN can outperform BPNN. Wilcoxon sign test is applied to render statistical evidence. The test result shows that both MTUNN and PENN outperform BPNN at 95% confidence. In average, mean square error of MTUNN can improve about 9% and that of PENN can improve about 11% in comparison with BPNN. However, there is no significant difference between MTUNN and PENN. The reason of why PENN cannot beat MTUNN is also explained.

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Forecasting the Ship Demolition prices using Artificial Neural Networks techniques

F. Khalili, E. Mesbahi
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Internal parameters in the maritime market can influence one or many other parameters in this market. Additionally, some external elements such as inflation, political issues and economic policies will affect certain outcomes. In such environment the main problem for creation of a "market model" is to recognise the most effective and influential input parameters on a set of desired outputs, whilst considering the time-dependant nature of the data. In this study, both static and dynamic Artificial Neural Networks (ANN) were implemented, trained and tested for various internal and external inputs and the desired outputs to find out the best combination of various elements. Performance of the network in terms of Mean Square Error (MSE) and correlation coefficient (R) has been measured and compared for every individual structure, and consequently the best functional relationship has been identified. In addition, the sensitivity of different parameters is identified, and the effectiveness of input parameters is demonstrated. The results of the studies indicated that it is feasible to implement a suitable Neural Network structure to map the inputs and the outputs accurately, and establish an acceptable "Ship Demolition Model" between selected/identified inputs and desired outputs

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Neural Network Model for Forecasting Crime

W. Gorr, J. Cohen
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We present a multivariate model for forecasting serious crimes in the short term based on temporal and spatial lags of lesser crimes. We specify a linear model with OLS estimation and a nonlinear model with estimation via a commercial software package, Neuralware. Also included for comparison are simple extrapolative and naïve models. A validation study uses extensive space and time series data from two medium-sized cities at the patrol district and census tract levels. Using any conventional forecast error summary (e.g., MAPE, MSE) for comparisons, the extrapolative methods are best by far. However, using a decision-rule measure (incorporating positives and false positives) for large forecasted increases in crimethe most valuable forecast information for police deploymentthe neural network model is best by far. We conclude that the neural network model is the most promising for police work, being easily implemented with commercial software and providing new information for crime prevention. Conventional forecast error summaries are inappropriate and misleading for this application (and, we suspect, for many kinds of management applications).

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TS3

Contributed session: Time series I

Monday, 12.00am-01.15am Room: C-1

Chair:Tucker McElroy
U.S. Census Bureau, Washington D.C, USA

Automatic trend extraction and forecasting for a family of time series

Th. Alexandrov, N. Golyandina
St.Petersburg State University, St.Petersburg, Russia

We present an automatic trend extraction and forecasting procedure suitable for processing of a large set of time series with similar behavior. The technique is based on the 'Caterpillar'-SSA approach. Since the 'Caterpillar'-SSA forecast of an extracted additive component is automatic in itself, the problem is reduced to automation of trend extraction. We consider a trend as a slowly varying component of the time series. It brings the problem of identification of slowly varying eigenvectors of the SVD of the time series trajectory matrix (see Golyandina, Nekrutkin, and Zhigljavsky (2001) 'Analysis of time series structure: SSA and related techniques'). The identification rule is based on contribution of low-frequency harmonics to the eigenvector form. This rule is controlled by 1) an upper bound of low-frequency interval and 2) a threshold for the low-frequencies share. We offer a way of choice of the threshold value, which gives results comparable to the interactive trend extraction. The proposed method is based on a measure of quality of trend extraction, which is applicable to the case when the true trend is unknown. This measure is consistent with the MSE between the extracted component and the trend when the latter is known. However, the testing on model data is insufficient as we deal with a nonparametric model of trends. For real-life time series with unknown trends we apply a bootstrap procedure and test the method on time series consisting of the extracted trend plus a generated noise. The example of application of the worked out technique to a family of real-life time series is presented. Since the considered time series are similar, we can take just several randomly chosen time series and then 1) test if the procedure works for such time series in general and 2) estimate a threshold proper for the whole family.

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Local Polynomial Regression Forecasting Colombian Food Inflation

N. Rodríguez
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This paper contains the results of a non-parametric multi-step ahead forecast for the monthly Colombian Food inflation, using Local Polynomial Regression kernel estimation over inflation changes, with the inclusion of rain as exogenous variable. Particularly Local mean or Nadayara-Watson, Local linear and local quadratic regression are tried. The forecast results are compared with those from an ARIMAX and a non-linear STAR. The usual goodness of forecasting measures, as well as the Diebold-Mariano statistics test, are used for forecast evaluation. The non-parametric forecast over perform the parametric alternatives.

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Coherent Signal Extraction for Time Series Observed at Diverse Sampling Frequencies

T. McElroy, T. Trimbur
U.S. Census Bureau, Washington, D.C. USA

This paper develops a coherent framework for signal extraction for stock and flow series observed at a variable frequency. As an illustration, we show how to transform the Hodrick-Prescott filter to yield inherently consistent trends in monthly, quarterly, and annual datasets. The method starts with an underlying continuous-time model, which is the only approach that allows sensible comparisons between filters obtained at diverse sampling frequencies. The standard approach then deduces from the continuous-time model a discrete-time model for a given sampling interval, the form of which depends on whether the variable is a stock or flow. We show that this discretization of the model yields sub-optimal signal extraction filters, when the continuous-time model is nonstationary. In addition, we derive the optimal signal extraction filters for both stock and flow variables, and provide some direction for the practical computation of filter coefficients. A suite of examples is furnished by considering the so-called smooth trend model, which gives rise to the Hodrick-Prescott filter. We describe the continuous-time analog of the Hodrick-Prescott filter, and provide a mathematically rigorous method for adapting the filter to diverse sampling frequencies.

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EC1

Contributed session: Business cycles indicators I

Monday, 12.00am-01.15am Room: C-2

Chair: Eduardo Loria
School of Economics, National Autonomous University of Mexico, Mexico, Distrito Federal

Taking the Temperature: Forecasting Growth for Mainland China

D. Curran, M. Funke
University of Hamburg, Hamburg, Germany

In this paper we present a new composite leading indicator of economic activity in mainland China estimated using a dynamic factor model. Our leading indicator is constructed from three series: exports, a real estate climate index, and a Shanghai Stock Market Exchange index. These three series are found to share an underlying, unobservable element which, by virtue of the model and its Kalman filter estimation of parameters and state vectors, yield our leading indicator of economic activity. Given China's outstanding economic performance in recent years, establishing it as an economic force to be reckoned with on the global stage, the need for timely estimates of Chinese economic activity has become all the more urgent. That said, despite the importance of China for the world economy, the number of studies developing and investigating leading indicators of economic activity in China is surprisingly scant. Our paper aims to address this deficit.
Recent revisions in Chinese GDP data; most notably that of December 2005 where official GDP revisions revealed an economy worth 16 trillion yuan in 2004, 17 percent more than was previously thought; are also captured. We use the proportional Denton procedure for temporal disaggregation of revised annual Chinese GDP data, allowing us to consider our leading indicator with respect to both pre and post-revision GDP. Subsequently, we use our newly constructed leading indicator to construct out-of-sample one-step ahead forecasts of Chinese GDP, the performance of which are evaluated using a number of established tests. These out-of-sample accuracy tests indicate that the small-scale factor model approach leads to a successful representation of the sample data and provides an appropriate tool for forecasting business conditions in China.

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Modelling the Business Cycle for South Africa: Linear vs Non-linear Methods

I. Botha
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An ongoing debate in business cycle research is the question of a stable economy (business cycle) influenced by exogenous shocks or an unstable economy with an endogenous business cycle (Classical vs. Keynesian view). This issue will be addressed by modelling the business cycle with a linear as well as a non-linear model. Linear models are usually used to demonstrate exogenous shocks on the business cycle, whereas non-linear models have more of an endogenous assumption regarding the business cycle. Non-linear models learn over time and adjust to the new level of peaks and troughs and can therefore predict turning points more accurately. This suggests that business cycles have changed since 1960: they became less volatile, more synchronized across the world and the amplitude of peaks and troughs is lower. Because of these characteristics it would be useful to fit a non-linear model to the business cycle. However, exogenous shocks cannot be totally ignored especially in an emerging market such as South Africa. The STAR (smooth transition autoregressive) model makes room for a linear and a non-linear component, and can over time determine if there is only a linear or non-linear component or sometimes both. The results of this study support the structural or institutional view. They believe economic fluctuations are caused by various structural or institutional changes. Adherents to this view do not believe that the market system is inherently stable or systematically unstable (Classical vs. Keynesian view). They focus on structural changes and unpredictable events. They do not have set ideas on economic policy. According to them the appropriate policy will vary from time to time as circumstances change.

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Causes of the slow rate of economic growth in Mexico

E. Loria,
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Since the early eighties the Mexican economy has entered into a severe phase of slowdown in its rate of economic growth. Through the estimation of a production function augmented by the real exchange rate, it is plausible to argue that the main reason rests on the fall of total factor productivity which links itself to the devastating effects of both financial and balance of payments recurrent crisis. These structural causes diminish significance to external transitory shocks.

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FM2

Contributed session: Improvements in forecasting II

Monday, 12.00am-01.15am Room: C-3

Chair: Alfonso Novales
Universidad Complutense, Madrid. Spain

The impact of weather in the short-term forecasting of SKUs

K. Nikolopoulos
Manchester Business School, Manchester, UK

R. Fildes, L. Upton
Department of Management Science, Lancaster University Management School, U.K

P. Goodwin, W. Y. Lee
The Management School, University of Bath, Bath, U.K.

Seasonal decomposition is one of the most frequently used methodologies in time series forecasting. One of the key drivers of seasonal behaviour is the weather, but, in many cases, the weather is inter-correlated with other seasonal drivers like public holidays and promotions. The sporadic effect of the weather in the short-term forecasting of products has been given very little attention in the forecasting literature. The present study examines 26 Stock Keeping Units (SKUs) from a multinational company. The demand for these products is very weather dependent. To take this into account, the forecasting team uses weekly weather profiles to adjust one-week ahead forecasts based on a 10-day ahead weather prediction that is provided by a national meteorological service. The results suggest that the weather adjustment procedure adds significant value to forecasting accuracy and it is argued that weather adjustment facilities should be introduced as a standard feature in Forecasting Support Systems.

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A Three-Stage Model for Forecasting Store-Level Consumer Demand

J. Joseph,
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Brand distribution and promotional decisions require store-level forecasts for Brand sales. This may be accomplished by developing individual store-level models using store-level sales and promotional data. The disadvantage in this is that the number of models could run into hundreds. Also, accuracy may be diminished where forecasts need to be extended to stores outside the modeled sample and the sales are not homogenous across stores. In recent years Mixed Effects Modeling has emerged as a very powerful predictive technique in situations where data heterogeneity limits the application of standard regression models. The advantages of these models are that they provide response effects at multiple levels of aggregation by pooling sub-groups within a level and also allow the estimation of a large number of parameters with relatively fewer observations by leveraging information across pooled groups using empirical and hierarchical Bayes estimation. We combine this technique within a three-stage model using store-level data for stores that sold the brand, to forecast sales in Stores that have not yet sold the brand. Using Mixed Effects models to account for store-level heterogeneity reduces the effect of aggregation bias, but the store-specific parameter estimates generated, cannot be effectively leveraged to forecast brand sales in un-modeled stores or channels. We first cluster the sample population of stores into homogenous groups based on similar demand and supply characteristics. A Mixed model is then identified in the second-stage with parameters estimated at the cluster and total levels. Treating cluster-membership to have a multinomial distribution, we develop a multinomial logit model for cluster-membership prediction in the third-stage. This is used to assign new stores to existing clusters, and then develop forecasts for those stores using the cluster-level parameter estimates.

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Comparing forecasting performance under discrete loss functions

A. Novales, F. J. Eransus
Universidad Complutense, Madrid, Spain

In some applications, discrete, asymmetric loss functions on forecasting errors seem appropriate. The analyst distinguishes between large and small forecast errors, as well as between positive and negative errors, but the implied loss does not change continuously with the size of the forecast error. We first show that the deterioration in size and power of the Diebold-Mariano test and some non-parametric tests (signs test and Wilcoxon test) when comparing the forecasting performance of alternative models in the presence of extreme-value forecast errors is drastically reduced when using discrete loss functions. On the other hand, size and power still display significant deviations from theoretical values when forecast errors do not follow a Normal distribution. Second, we propose simple alternative tests for forecasting performance based on discrete loss functions. A new test is shown to have a more exact size than the tests mentioned above in a variety of situations, in addition to having higher power when forecast errors are not autocorrelated.

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K2

Monday, 02.15pm-03.15pm Room: Paraninfo-P1

Chair: Jose Antonio Ortega,
Universidad de Salamanca, Salamanca, Spain

Stochastic Forecasting for Population and Government Budgets

Ronald Lee
University of California, Berkeley, USA

Long run projections of population are in demand because of their importance for fiscal planning, particularly for pension systems, and for environmental planning. Because of special features, population forecasts require separate attention and general forecasting methods may not be most effective. The two most common methods for projecting fertility, mortality, and migration are expert judgment and time series analysis. Both can be extended to the stochastic context using stochastic simulation. I will emphasize time series methods. The Lee-Carter method forecasts mortality by using time series methods to model a time varying mortality index which in turn shifts a cross-sectional age distribution of mortality. A similar approach to fertility is less successful, but by drawing on outside information, can be made to work. Immigration poses other problems, and I will treat it as deterministic here. With these three time series processes modeled, perhaps as a linear system, the population can be projected using stochastic simulation. Furthermore, stochastic forecasts of government budgets can be made by using estimated cross sectional age schedules of taxes paid and dollars of benefits received for various programs, where these age schedules are stochastically shifted by projected time series of earnings growth. Government debt or trust funds are compounded by a stochastic interest rate. I will show representative population forecasts, age profiles and budgetary forecasts.

Ronald Lee is the Jordan Family Professor of Economics and Professor of Demography at the University of California at Berkeley, where he also is Director of the Center for the Economics and Demography of Aging. He holds a Ph.D. in Economics from Harvard University, and M.A. in Demography from Berkeley. Before moving to Berkeley in 1979, he taught at the University of Michigan for eight years. He is an elected member of the National Academy of Sciences, the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and a Corresponding Member of the British Academy. His research interests include the economic demography of intergenerational transfers and evolutionary theories of aging. He has developed new methods for population forecasting, combining approaches from statistics and demography. In particular, he has developed methods of making probabilistic forecasts of fertility, mortality, and population growth and age structure. He has developed related methods for making probabilistic long run budgetary projections, particularly for Social Security.

B1

Invited session: Bayesian methods

Monday, 03.30pm-04.45pm Room: Riancho-P2

Chair: Arnold Zellner,
University of Chicago, USA

Objective Bayesian Variable Selection: Intrinsic prior distributions

Elías Moreno
Universidad de Granada, Granada. Spain

A basic problem in regression is the selection of a subset of influential regressors from the set originally proposed. The frequentist approach to this problem finds serious difficulties which come from two sources: the presence of nuisance parameters and the need to carry out multiple tests. The Bayesian approach does not share the above difficulties; the problem has a natural formulation as a model selection problem among a multiplicity of models. The main difficulty is to elicit prior distributions for the model parameters. A large or even moderate number of parameters precludes to subjectively assessing the priors. The process of elicitating conventional priors, such as conjugate priors, needs to assess a large number of hyperparameters. The natural alternative is to use an objective method. However, the objective priors used for estimating parameters are typically improper, and thus are not suitable for model choice. This presentation revises the so-called intrinsic prior distributions for hypotheses testing in linear models. These priors are automatically derived from the structure of the models, and hence they need not adjust any hyperparameter, provide suitable Bayes factors for model comparison, and extremely good solutions to the model selection problem.

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Objective Bayesian Variable Selection: Comparison of Bayesian procedures based on intrinsic priors

J. Girón, M. L.Martinez
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In the objective Bayesian approach to variable selection in regression a crucial point is the encompassing of the underlying nonnested linear models. Once the models have been encompassed one can define objective intrinsic priors for the multiple testing problem involved in the variable selection problem.There are two natural ways of encompassing: one way is to encompass all models into the model containing all possible regressors, and the other one is to encompass the model containing the intercept only into any other.In this presentation we compare the variable selection procedures that result from each of these two ways of encompassing by analyzing their theoretical properties and their behaviour in simulated and real data

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Objective Bayesian Variable Selection: Computational issues

G. Casella
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The objective Bayesian variable selection criterion is to provide an ordering of the models according to the value of their intrinsic posterior probabilities. Assuming k possible regressors, the number of model posterior probabilities to be computed is 2^{k}which is a huge number even for moderate values of k. The obvious solution is to identify a reasonable number of models having larger model posterior probabilities for which a search algorithm is necessary. We argue that a good stochastic search algorithm is obtained by exploring the set of models in two steps: first in the class of models with a given number of regressors, and then jumping among classes with different number of regressors. The variable selection criterion is here used to direct the stochastic search algorithm that is based on a Markov chain with stationary distribution proportional to the criterion. The main difficulty is in choosing an appropriate candidate distribution. In large-scale researches the candidate has to be able to both find states with large values of the criterion and to escape from modes in order to able to adequately explore the space. Our algorithm is essentially an independent Metropolis algorithm and, as such, does not suffer from some disadvantages of a random walk algorithm, in that it does not have a tendency to get stuck in local modes. Moreover, although the candidate distribution changes at each iteration, each results in a kernel that satisfies the detailed balance condition with the same stationary distribution, resulting in a ergodic Markov chain. We present simulations which indicate the high efficiency of the algorithm.

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EC3

Invited session: Forecasting turning points in economics with non-linear models.

Monday, 03.30pm-04.45pm Room: Bringas-P3

Chair: Laurent Ferrara,
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Using the Dynamic Bi-Factor Model with Markov Switching

K. Kholodilin
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The appropriately selected leading indicators can substantially improve the forecasting of the peaks and troughs of the businesscycle. Using the novel methodology of the dynamic bi-factor model with Markov switching and the data for three largest European economies (France, Germany, and UK) we construct composite leading indicator (CLI) and composite coincident indicator (CCI) along with the corresponding recession probabilities. We estimate also a rival Markov-switching VAR model in order to see, which of the two models brings better outcomes. The recession dates derived from these models are compared to three reference chronologies: those of OECD and ECRI (growth cycles) and those obtained with quarterly Bry-Boschan procedure (classical cycles). Dynamic bi-factor modeland MSVAR appear to predict the cyclical turning points equally well without systematic superiority of one model over another.

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Can the SupLR test discriminate between different switching regression models? Applications to the US GNP and the US/UK exchange rate

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ENS Cachan Département Economie et Gestion, MORA and IEF Senior Academic Fellow , France

In this paper, we study the ability of the SupLR test to discriminate two classes of non-linear switching models: the Markov Switching Auto-Regressive (MS-AR) model and the Threshold Auto-Regressive (TAR) model. This work is motivated by the fact that such models are generally used in empirical applications without any statistical justification. By using simulation experiences, we show that it is very difficult to discriminate between MS-AR and TAR models. This means that, when the null hypothesis is rejected, it appears that different switching models are statistically significant. The power of the SupLR test seems to be sensitive to the mean, the noise variance and the delay parameter of the previous models. Finally, we apply this methodology to the US GDP growth rate and the US/UK exchange rate.

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Volatility or Volume: Which is the best to forecast Stock markets? The case of some Asian Markets

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In this paper, the predictability of both volume and volatility for some Asian Markets has been investigated. Empirical finance literature has mainly concentrated on trying to predict returns and volatility, or to detect turning points, but has hardly paid any attention to volume. In this paper, using a Threshold Transfer Function Model, we compare the ability of both volatility and volume to best forecast turning point in Stock markets. Applying our approach to daily returns and volume exchanges of some emerging markets surrounding the 1997 Asian crisis, we find that volume exchanges give better results than volatility. This method also permits to measure interdependence between diverse markets.

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O2

Contributed session: Applied forecasting I

Monday, 03.30pm-04.45pm Room: Audiencia de la Reina-P4

Chair: Patrick McSharry
Oxford University, UK

Forecasting medicine prescriptions in Asturias (Spain) with Box-Jenkins and neural nets

J. Parreno, **D. de la Fuente, P. Priore, A. Gomez**
University of Oviedo, Gijón. Spain

In Spain, the Social Security (i.e. the Public Health System) Budget relays on the local Administrations of every Region. From this Budget, a very important amount of money goes to finance, totally or partially, medicines for people. If the Administrations don't take this issue seriously, the expenses can be overwhelming. In this job, a Spanish region called Asturias is analyzed in terms of the number of medicines prescribed and charged to the Social Security System. Besides, Public Health policies have lead to important political crisis in Asturias several times over the last years. Due to these facts, it would be very interesting for regional Administrations in Spain to have at their disposal accurate forecasts to estimate their future expenses in medicines. In this job, two time series are analyzed: total number of Social Security prescriptions to active people and to pensioners. These series are composed of monthly data ranging from January 1998 to April 2004. Monthly data up to December 2003 are modelled to obtain forecasts for the period January 2004 April 2004, so that they can be compared to actual data. Time plots show very different behaviour, especially in terms of trend, for both series. Two well-known methods are used to obtain forecasts: Box-Jenkins ARIMA models and Artificial Neural Networks. Forecasting performance is measured in terms of MAPE (Mean Absolute Percentage Error), so that both forecasting methods can be compared.

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Nonparametric Modeling and Forecasting of Inflation Changes

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Several authors have shown that there exists a significant relationship between interest rate yield spreads and future changes in the rate of inflation, a result that holds across several countries. The objective of this paper is to examine whether there exist significant non-linearities within this relationship, and also to determine whether non-linear models can assist in forecasting inflation changes. We find that for horizons of relevance to monetary policy, non-linearities are most apparent for extreme values of the yield spread, consistent with notable tightening or loosening of policy. At longer horizons non-linearities become even more pronounced, possibly due to inflation expectations that overlap more than one business cycle. In a forecasting exercise we find that nonlinear models outperform the linear benchmarks at all but the shortest horizons.

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Asthma forecasting: using telemedicine and environmental conditions to assist self-management

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Changes in environmental conditions, such as temperature, humidity, pressure, pollution and pollen are known to affect the number of people suffering from cardiovascular and respiratory conditions. The link between asthma and weather has already been shown by the increase in the number of accident and emergency admissions of asthmatics after thunderstorms. A mobile telephone based telemedicine system is used here to obtain measurements of peak expiratory flow, twice daily, from 58 mild-to-moderate asthmatics. Using these physiological measurements and a database of weather, pollution and pollen, it is possible to directly investigate the relationship between lung function and local environmental conditions. Different models are constructed for the entire group and for individual subjects. Temperature and pressure are the primary environmental variables for determining morning lung function, whereas temperature and pollution are most important in the evening. The variety of relationships between the explanatory variables and lung function suggests that individual models are required to provide tailor-made advice. Results of the analysis imply that environmental conditions should be considered for determining personal management plans and that forecasts could be used to improve self-management.

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T2

Contributed session: Technology forecasting I

Monday, 03.30pm-04.45pm Room: Santo Mauro-P5

Chair: Steven Schanaars
Baruch Collage, New York, NY

A multi-country investigation of left-skew in technology forecasting

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We might expect the diffusion of cellular telephones, especially in the first generation, to exhibit a left skew as the fixed telephone networks in many countries are supply restricted. That is a reservoir of unsatisfied demand for access to an inter-active network may lead to an unusually rapid diffusion of cellular telephones. Another explanation is that the typical diffusion curve of an interactive technology is left skewed compared to a non-interactive technology. We use the same data set as Islam and Meade (data from 70 countries covering all geographical regions and economic categories with a comprehensive set of economic, cultural and telecommunications variables) to measure the evidence for left-skew using sales take-off times (i.e. the time from when sales begin until sales begin to increase rapidly). Sales takeoff is an important measure as it helps to predict whether a new product will be successful. We also use the Gamma Shifted Gompertz (G-SG) model proposed by Bemmaor to estimate the skew. The implications of left-skew on forecasting are discussed.

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Demand Forecasting for Mobile Video Telephony in Korea

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Mobile telecommunication has been popularized in many counties so that the demand for various services beyond basic communication and SMS (Short Message Service) has been also increasing all over the world. Mobile phone producer and mobile service provider accelerate technological innovation to provide these new emerging services, such as photo, data transmission, entertainment including game and music, internet browsing, and video telephony (MVT), and the like.The purpose of this research is to analyze customers' preference for MVT which is at an early stage preparing commercial use in Korea. From the discrete choice analysis using 500 conjoint data, we investigate how technical and socio-economic factors such as resolution, battery, temporary loss of picture, service price, personal income and other individual characteristics affect consumers' choice for MVT. We also examine the influence of new technical function on the demand for MVT, which is the solution for the users' unmet eyes caused by the separation of camera and display in video telephony. Using this consumer preference analysis, we forecast the demand for MVT in Korea. Finally policy implications derived from research results are also discussed, which is very useful to the phone producers and service providers.

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Archetypes of technological forecasting

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This paper reviews the record of past technological forecasts over the past 100+ years to discover a number of archetypes about the strategies people use to make such forecasts and how they turn out. The results suggest that when looking 10 to 20 years ahead forecasters tend to repeat the same forecasting strategies over and over again, failing to learn from what has happened before. As a result, the same outcomes tend to be repeated.

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NN2

Contributed session: Neural Nets I

Monday, 03.30pm-04.45pm Room: Infantes-P6

Chair: Marcus 0'Connor
University of Sydney, Campsie, Australia

Addressing Unusual Time Series Observations via Sequential Bayesian Kernel Modelling with T-Student Noise

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Dealing with unusual observations and outliers is an ongoing research issue in the development of forecasting models. Unusual observations are found in many time series, e.g. electricity spot prices. Ideally, we would like to develop robust forecasting models that can handle outliers. Kernel-based methods are increasingly popular in machine learning. In particular, the Relevance Vector Machine (RVM) for regression and classification with arbitrary kernels is very attractive for its probabilistic forecasts. In such a model, the posterior distribution of the weight parameters is estimated after maximizing the marginal likelihood of their prior hyper-parameters. This is performed by an iterative adjustment that shrinks some weights towards zero. However, the standard RVM operates in a batch mode, which is computationally inefficient due to unstable covariance matrices and is therefore unsuitable for time series forecasting. Moreover, there has been no prior research on the sensitivity of the RVM to outliers, especially on the possible subsequent effects on the determination of the kernels. In short, the design of robust algorithms for time series forecasting using the RVM is still a challenge. This paper addresses this challenge, by developing a sequential approach to the RVM for time series forecasting, which tackles unusual observations via a Kalman filter algorithm for linear kernel models using t-Student noise distributions (StRVM). The adaptive model selection is organized in two steps: sequential optimization of the weight parameters according to this extended Kalman filter, and the re-estimation of the weights' prior hyper-parameter for pruning redundant kernels. This novel approach is compared to other “Bayesian”-type of kernel approaches: the batch RVM, the variational (VRVM) that is essentially an offline RVM with t-Student noise, and the standard Gaussian noise model. Finally, results and implications for further research are reported.

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Modeling Seasonality in Neural Forecasting: An Unconventional Approach

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There has been considerable research in the past on forecasting with artificial neural networks. Such studies involving forecasting with neural networks have either advocated the use of raw data and some have emphasised prior deseasonalisation. While a couple of recent studies on seasonality in neural time series forecasting affirm that neural networks are inept at modelling the seasonal component of a time series, these undermine the neural network's ability to approximate any given function, in theory. Why are neural networks inept at modeling seasonality? In this study, we present evidence of an alternative technique based on experimentation on M-competition monthly time series (Markidakis et al., 1982) that facilitates in overcoming this shortcoming. The technique is based on an approach that segregates a time series into its individual seasonal components and constructs as many times series as there are number of seasons. It merits from the fact that there may be higher autocorrelation in lagged seasons than there is in consecutive lagged values for many datasets. Initial empirical results tell us that this novel approach outperforms other neural network models and some statistical methods. A rigorous and comprehensive evaluation is needed to compare the technique to commonly used forecasting methods for modelling a seasonal time series and other neural network models.

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Automatic Modelling and Forecasting with Neural Networks A forecasting competition evaluation

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Despite over 15 years of research and over 4500 publications on artificial Neural Networks (NN) for forecasting, they have shown competitive performance in forecasting competitions. The results of the M3 competition indicate the comparatively poor performance of NN for automatic forecasting, falling far short of their presumed potential. One of the hindrances appears to be the complex modelling process based largely on expert experience, making their application more an art then science and prohibiting large scale automation in forecasting. Recently, optimistic publications by Liao and Fildes, Hill et al., Zhang and Qi etc. indicate comprehensive performance of NN on single time series and subsets of previous competitions, indicating progress in developing different methodologies. Consequently, we propose a forecasting competition to evaluate a set of consistent NN methodologies across a representative set of time series. We seek to answer two essential research questions a.) What is the performance of NN in comparison to established forecasting methods? And b.) What are the current “best practice” methodologies utilised by researchers to model NN for time series forecasting. This presentation outlines previous research, results from a current forecasting competition, and presents the call for participation for the 2006-2007 NN3-competition, funded by SAS and the IIF.

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EC2

Contributed session: Business cycles indicators II

Monday, 03.30pm-04.45pm Room: Biblioteca-P7

Chair: Frederick Demers
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A Multi-Sectoral Flash Indicator for the Swiss Business Cycle

S. Gübeli, M. Graff, M. Wildi
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In this paper, we outline the design and construction of a new flash indicator for the Swiss business cycle, which is supposed to replace the economic barometer of the Swiss Federal Institute of Business Cycle Research (KOF), and we report evidence on its performance. The barometer has been a prominent composite indicator among observers of the Swiss economy. It is designed to signal trend and inflection points of the GDP growth rate with a lead of six to nine months. Having undergone several revisions since its development in 1976, it has been published in its present form since 1998. It combines six low pass filtered indicators from business and consumer surveys by extracting their first principal component. Meanwhile, the targeted lead has gotten less pronounced and a revision seems adequate. Furthermore, the first forecasts of the barometer have often been misleading due to the malfunctioning of the symmetric filter. Particularly with regard to the improved data availability, we propose a very different multi-dimensional design. The new instrument combines over 20 synchronised indicators bundled separately by sectors that follow highly volatile tracks, which are pronouncedly distinct from the rest economy. The incorporated indicators are identified in a standardized search routine as highly correlated to the sectoral reference series with a lead of at least two quarters. To minimise revisions as new data is added, we refrain from low pass filtering and we are cautious to use seasonal adjustment. As an alternative, we refer to a direct filtering approach. The performance of the new instrument is very encouraging. The in-sample fit is extraordinary both in terms of phase and amplitude. The correlation also holds out-of-sample, whether compared to preliminary official data and to in-house macro model forecasts. Moreover, conventional goodness-of-fit statistics confirm that the new flash indicator is superior to the barometer.

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Identifying Business Cycle Turning Points with Sequential Monte Carlo Methods

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This paper evaluates the ability of Markov-switching latent-factors models to identify turning points in the European economic activity and propose a full Bayesian approach for the estimation. While a number of studies have applied Gibbs sampling techniques to the estimation of Markov-switching models, we propose a sequential Monte Carlo (SMC) method, based on importance sampling. The SMC approach processes the observations sequentially: it is very useful for estimating nonlinear time-series models and suitable for on-line applications. We use SMC to filter the latent factors and to estimate the parameter of the model and evaluate its ability to detect turning points in real time.

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Forecasting Housing Investment: The Case of Canada

F. Demers
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The author proposes and evaluates econometric models that try to explain and forecast real quarterly housing expenditures in Canada. Structural and leading-indicator models of the Canadian housing sector are described. The long-run relationship between expenditure and its determinants is shown to have shifted during the late 1970s, which implies that important changes have occured in how the housing market is driven. The author finds that the response of housing investment to interest rates has become more pronounced over time. He compares out-of-sample forecasts from linear and non-linear cointegration models (which make use of information on fundamentals such as wealth and demographics) with forecasts from simple leading-indicator models (which exploit information such as housing starts or household indebtedness). The author finds that simple leading-indicator models can provide relatively accurate near-term forecasts. The preferred structural model, which allows for a shift in the cointegrating vector, provides a rich analysis of the housing sector, with good forecast accuracy on the construction side but not on the resale side, which is more difficult to predict.

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F1

Contributed session: Forecasting distributions

Monday, 03.30pm-04.45pm Room: C-1

Chair: Carlos Maté
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VaR competition: Measuring the degree of adjustment of Value at Risk methodologies

C. Gonzalez, R. Gimeno
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Value at Risk (VaR) methodologies have became increasingly popular in the last times because, in addition to legal requirements, they reduce the risk of a portfolio to a single number that provides the maxima loss associated to a portfolio with a given probability. However, they do not indicate which would be the loss in case that an anomalous event causes extreme negative returns. The objective of this paper is to evaluate if these methodologies make a good estimation of the market risk. In particular, it is compared four Value at Risk methodologies: Normal, GARCH, Historical Simulation and Extreme Values with Pareto distribution, for several levels of significance and for 36 indexes covering stock-exchanges worldwide. For the Extreme Value approach, this paper proposes an automatic procedure to obtain the threshold that divides the distribution between extreme values and normal ones. This analysis is made through three concrete measures: the proportion of returns that fell out of the VaR value, which indicates the degree of accuracy reached by each method; the mean VaR, which provides the average provisions required to hedge from the losses forecasted by VaR; and finally the total amount of all losses over the VaR, which gives a proxy of the losses will have to cope with out the coverage of VaR provisions. We then establish multicriteria rankings for better hedging the market risk. It is shown that, for the lower significance levels, Extreme Value methodology with a Pareto distribution for the tails as it is developed in the paper is the best suited approach.

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Forecasting Heavy-Tailed Densities with Positive Edgeworth-Sargan and Gram-Charlier Expansion

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This paper introduces a transformation of the Edgeworth-Sargan distribution, which we name Positive Edgeworth-Sargan (PES). The main advantage of this new density is that it is well defined for all values of the parameters in the parametric space, besides of integrating up to one and of allowing a fairly straightforward computation of its quantiles. Its performance for full density forecasting is evaluated by using graphical techniques through an empirical application for daily exchange-rate returns. In addition, the ability of the PES versus the Student's t for VaR forecasting is compared by using different criteria, including: probability quantile loss and forecast encompassing tests. Our results show that the proposed function provides more reliable forecasts of the full density and its tails, in presence of leptokurtosis.

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Smoothing methods for histogram-valued time series

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A histogram-valued time series (HTS) is a sequence of observations taken at regular time intervals, where the observation is recorded as a histogram. Histograms describe probability or frequency distributions in a discretized form. Thus, HTS allow the representation of the temporal evolution of a discretized distribution. HTS usually will arise in summarization and aggregation contexts. For example, consider that the interest lies on the analysis through time of the behavior of a variable measured in a sample of individuals. These individual measures are usually summarized by a mean. Instead, in this approach, these measures are summarized by means of histograms. The resulting time series (that will be a HTS) will allow us to track the evolution through time of histogram features such as extension, asymmetry, normality and so on. These features cannot be analyzed if a classical time series, where each instant represents the mean of the sample of individuals, is considered. In this presentation the concept of HTS will be introduced. They are a particular case of symbolic-valued time series that are series where the variable observed through time is a symbolic one (e.g. an interval variable or a boxplot variable). Some concepts pertaining to histograms will also be commented. They include the density and distribution functions of histograms, how to do arithmetic operations when the operands are histograms, and how to measure accuracy in a HTS context. These concepts will be taken as a basis to propose an approach to forecast HTS. Forecasting methods proposed for HTS will consist of the adaptation of well-known forecasting methods for the classical context, such as moving averages and exponential smoothing methods. The whole approach will be illustrated by means of a real-life example.

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EC15

Contributed session: Structural Models

Monday 03.30pm-04.45pm Room: C-2

Chair: Thomas Lindh
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Traditional versus Unobserved Components Methods to Forecast Quarterly National Account Aggregates

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We aim to assess the ability of two alternative forecasting procedures to predict Quarterly National Account (QNA) aggregates. The application of Box-Jenkins techniques to observed data constitutes the basis of traditional ARIMA and transfer function methods (BJ methods). The alternative procedure exploits the information of unobserved high- and low-frequency components of time series (UC methods). An informal examination of empirical evidence suggests that the relationships between QNA aggregates and coincident indicators are often clearly different for diverse frequencies. Under these circumstances, a Montecarlo experiment shows that UC methods significantly improve the forecasting accuracy of BJ procedures if coincident indicators play an important role in such predictions. Otherwise (i.e., under univariate procedures), BJ methods tend to be more accurate than the UC alternative, although the differences are small. We illustrate these findings with several applications from the Spanish economy with regard to industrial production, private consumption, business investment and exports.

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The Natural Interest Rate in Brazil, 1999-2005

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The aim of this paper is to estimate the natural interest rate level in Brazil after the implementation of the Inflation Targeting System. Many Brazilian authors had investigated the main reasons that have kept the real interest level so elevated in Brazil. In seeking to contribute to the debate, the present work presents three distinct estimates about the long term interest rate behavior in Brazil. Firstly, an analysis of the real interest rate concept is made, making clear the importance of the subject in the Brazilian monetary policy. In the second part, statistical filters are used in the ex ante and ex post real interest series, followed by the estimation of a dynamic Taylor Rule that permits the obtainment of the real interest rate implicit to the monetary policy decisions in the Brazilian Central Bank since the adoption of the targeting regime. The third part is dedicated to estimate the natural interest rate in Brazil after the implantation of the Inflation Targeting System. The evolution of the natural rate is extracted from a simplified macroeconomic model in state-space form, that includes a New-Keynesian Phillips Curve and a IS Curve. The results indicate that the monetary policy decisions have been maintaining the real interest level oscillating close to the natural rate, signalizing a neutral conduction by the Brazilian monetary authority in most part of the analyzed period.

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Growth and Longevity from the Industrial Revolution to the Future of an Aging Society

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T. Lindh, B. Malmberg
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Aging of population will affect the growth path of all countries. To weight the historical and future importance of this claim we use two popular approaches and evaluate their merits and disadvantages by confronting them to Swedish data. We first simulate an endogenous growth model with human capital linking demographic changes and income growth. Rises in longevity increase the incentive to get education, which in turn has ever lasting effects on growth through a human capital externality. Secondly, we consider a reduced-form statistic model based on the demographic dividend literature. Assuming that there is a common DGP guiding growth through the demographic transition, we use an estimate from post-war global data to backcast the Swedish historical income growth. Comparing the two approaches, encompassing tests show that each of them contains independent information on the Swedish growth path, suggesting that one should benefit from combining them for long-term forecasting.

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FM7

Contributed session: Aggregate versus disaggregate forecasting

Monday 03.30pm-04.45pm Room: C-3

Chair: Antoni Espasa
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Optimal combination forecasts of the Australian labour market

R. A. Ahmed, R. J. Hyndman
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We apply the optimal combination approach for hierarchical time series to forecasting net labour turnover in Australia. Not only is it important to forecast the rate of job turnover in the economy as a whole and across major occupational groups but it is also important to do so at the individual occupation level. There are 340 occupations at the lowest level of the Australian labour market hierarchy. We seek forecasts for each of these occupations, and for all aggregate groupings of occupations. This application raises various computational difficulties associated with inverting huge matrices which we solve by exploiting patterns in the matrices and using sparse matrix algebra. We illustrate the application by comparing forecasts for several key occupations with the forecasts obtained if the hierarchical information is ignored.

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Optimal combination forecasts for hierarchical time series

Rob J. Hyndman, Roman A. Ahmed
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In business and economics there are often applications requiring forecasts of large numbers of related time series having a hierarchical structure. That is, there are many time series that can be aggregated at several different levels. We call these 'hierarchical time series'. They are commonly forecast using either a bottom-up or a top-down approach. In this paper we propose a new approach to hierarchical forecasting which provides optimal forecasts that are better than either top-down or bottom-up forecasts. Our approach is based on forecasting all series at all levels of the hierarchy and then using a regression model to optimally combine the forecasts. The resulting forecasts are aggregate consistent (i.e., they add up), are unbiased and have minimum variance amongst all combination forecasts under some simple assumptions. We show in a simulation study that our approach performs well compared to the conventional top-down and the bottom-up approaches. It also allows us to construct prediction intervals for the resultant forecasts.

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Forecasting Industrial Production in the Euro area

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Indexes for the industrial production as a whole are very useful indicators to follow the business cycle of an economy. At the same time, in a procedure for economic forecasting it matters to get information at the disaggregated level of geographical regions (member states in the euro area) and sectors, because this is very relevant for diagnosis purposes and in most cases improves the forecasting accuracy of aggregated models. This paper attempts to forecast the aggregated industrial production index in the euro area by considering models for the aggregate univariate models and transfer function models- and for the components univariate, single- equation transfer functions and vector models. Disaggregated data is analyzed considering possible cointegration relationships between the components and looking for specific sectorial leading indicators. This disaggregated information is used in two ways: (1) In a vector model for the components and through aggregation obtain the forecast for the aggregate and (2) in a single-equation model for the aggregate with lags of the components, using a vector model for the components to forecast them in the equation for the aggregate. Finally using outside sample data for the last five years the paper studies the forecasting performance of all models including combinations between them and proposes a methodology to generate monthly updated forecasts of a path up to 24 months for the aggregate and the components.

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O9

Invited session: Prediction of work effort. Evidence on expert judgement and formal models.

Monday, 05.15pm-06.30pm Room: Riancho-P2

Chair: Scott Armstrong,
University of Pensilvania, USA

Estimation of software development work effort: Evidence on expert judgment and formal models

M. Jorgensen
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This paper reviews empirical research on software development work effort predictions. The goal of the review is to provide recommendations on when to use expert judgment, when to use formal models to predict work effort, and, when to combine these. I review seventeen studies comparing software development effort prediction models with expert judgment. While most other comparisons of models and judgment are in favour of use of models, our results suggest that experts' predictions of software development effort are typically more accurate than those based on formal models. The most essential question, however, is not whether one prediction method on average is better than another, but when to use which method. Based on the review, I recommend that work effort predictions should be based on structured, expert judgment when: the estimation models are not calibrated to the organization using the model (models derived from data sets collected in other organizations typically leads to poor estimation models) situations lack stable relationship between input variables and work effort, experts possess and efficiently apply important domain, people or task knowledge not included in the formal prediction models, uncertainty is low, or, uncertainty is high and but the factor leading to the uncertainty is not a variable of the formal model simple estimation strategies (heuristics) are valid, or, impact from irrelevant information, anchors and goals different than accuracy are believed to be weak. When both experts and formal models are able to provide meaningful work effort predictions, they are independent, and, there is no obvious best choice, a combination of expert and model-based predictions can be expected to improve prediction accuracy.

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Discussants:

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Case Western Reserve, USA

R. Hogarth
Universidad Pompeu Fabra, Spain

J. Dana
University of Illinois, USA.

EC4

Invited session: Consensus economics

Monday, 05.15pm-06.30pm Room: Bringas-P3

Chair: Roy Batchelor
Cass Business School, London, UK

Heuristics for the Improvement of Consensus Forecasts

P. Hubbard,
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In 2005 Consensus Economics undertook a research project on the academic literature on forecasting accuracy, the behaviour of forecasters during our 24 month forecast cycle and the responses of forecasters to our survey methodology. Using our database of historical forecast data collected since 1989 we then investigated the characteristics of this data, and later examined it for forecast weaknesses which could be improved through intuitive statistical corrections. Using a heuristic process of corrections and testing to endeavour to reduce the mean absolute error over the 14 year data history, we worked through staged levels of corrections to develop an Econometric Adjusted Consensus (EAC) of gross domestic product. To test the robustness of the EAC model we first extended it from the initial G-7 country coverage to a broader group of countries and then to other variables, including personal consumption, industrial production and consumer price inflation. Finally, we examined the overall magnitude of the improvements achieved and their consistency.

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How far ahead can we forecast? Evidence from cross country surveys

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Using monthly forecast data from Consensus Economics for 18 developed countries reported over 24 different forecast horizons, we found wide diversity in the quality of forecasts across countries, and the horizons at which forecasts start becoming useful. For only seven countries (viz., Austria, Belgium, Canada, Denmark, Germany, Norway and U.S.) the initial 24-month-ahead forecasts beat the naïve no-change forecast. In terms of the worst performance, Irish, Portuguese, Swiss and Dutch forecasts beat the naïve forecast as late as at horizons 10-13 months. We also found that that generally the survey forecasts do not have much value when the horizon goes beyond 18 months. The flow of new information to annual GDP growth forecasts follows a bell-shaped curve over horizons with a peak point when the forecast horizon is around 13 months.

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"Bias" in Macroeconomic Forecasts

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This paper documents the presence of systematic bias in the real GDP and inflation forecasts of official and private sector bodies in the G7 economies in the years 1990-2005. The data come from the monthly Consensus Economics forecasting service, and bias is measured and tested for significance using parametric fixed effect panel regressions, and nonparametric tests on rank statistics. We examine patterns of bias across countries and forecasters to establish whether any observed bias reflects inefficient use of information, or whether it reflects rational response to financial, reputational and other incentives operating on forecasters. In several G7 countries there is evidence of a change in the trend growth rate. In these circumstances, standard tests for rationality are inappropriate, and a bias towards optimism in the consensus forecast is inevitable as rational forecasters learn about the new trend. In all countries there is evidence that individual forecasters converge too slowly on the consensus forecast. However, the persistently optimism of some forecasters, and the persistent pessimism of others, is not consistent with the predictions of models of "rational bias" that have become popular in the finance and economics literature.

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TR1

Contributed session: Transportation

Monday, 05.15pm-06.30pm Room: Audiencia de la Reina-P4

Chair: Peg Young
US Department of Transportation, USA

Forecasting freight transport demand with an ECM : an application to transalpine transport.

J. Brunel
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This paper purposes to apply an error correction model (ECM) in order to forecast freight transport demand through Alpine crossings.In a first part, freight transport forecasting models are briefly reviewed. It is not a major issue of transport economics. The issue remains mainly operational. It is generally developed outside the academic field by engineers, public authorities or transport consultants. The case of transalpine transport forecasting demand model offers a great example of the poor academic interest. Two factors tend to make academics more concerned by the issue. Firstly, some researchers investigate if the link between transport and growth can be broken in order to reduce transport externalities. Secondly, time series econometrics offers a new framework to estimate freight determinants. These two factors are responsible of an increasing number of papers above the issue. In a second part, an ECM is applied in order to estimate the relation between transalpine freight demand and Italian industrial production. Three kinds of flows are considered according there geographic characteristics. Freight demand is given by a database collected by Swiss Transport Ministry (Alpinfo). Italian industrial production is given by ISTAT. The sample concerns the period [1984-2004]. The ECM is estimated following Granger two steps method. Long- and short-term transport elasticities are given by this estimation. Explosive elasticities are found for transalpine transport between Italy and Iberian peninsula.

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How Airlines Forecast their Passengers Demand

M. Hamoudia
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M. Scaglione
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Airline Industry (Domestic and International) has grown by more +7% in 2005, the highest growth rate since 2000 . Average occupancy rate (79%) reached also a highest level since 2000. However, in the same time, this industry had also to face many difficulties and increasing constraints : high competition particularly from low cost companies, deterioration in yields, explosion of oil prices, security and terrorism, pandemies (mainly SARS and Influenza), increasing airports fees (for security and services handling). The objectives of this study are to identify how airlines forecast their scheduled passenger demand, what kind and what are the main problems and issues they have to face, and how their fortecasting methods have changed from 1990 to 2006. The method used here is to compare empirical results from surveys conducted from 1990 to 2006. A questionnaire was mailed to major IATA member airlines that had reported passenger traffic.

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Turning points in Transportation Services Index (TSI)

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The Bureau of Transportation Statistics, an agency within the Research and Innovative Technology Administration of the U.S. Department of Transportation, publishes the transportation Services Index (TSI), a monthly output index on U.S. transportation services for-hire. For this presentation, we will demonstrate, through the identification of turning points, the relationship of the three components of the TSI total, passenger and freight with key economic variables. Through this work, we hope to demonstrate how transportation leads the U. S. economy.

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EN2

Contributed session: Energy II

Monday 05.15pm-06.30pm Room: Infantes-P6

Chair: Maxwell Stevenson
The University of Sydney, Sydney, Australia

Apolo: A short term wind power forecasting system based on artificial neural networks

A. Muñoz, J. Marín, R. Palacios, E. Sánchez-Úbeda
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A. Mateo, A. Tostado
Wind to Market S.A.

Since the publication in March 2004 of the Royal Decree 436/2004 which established a special regime for wind energy producers, 90% of the wind energy in Spain is being sold as any other source of energy in the electricity market (the other 10% is remunerated at a fixed price or tariff). This migration from fixed tariff to liberalized market has been stimulated by economic incentives for producers, but has also been accompanied by a significant penalization of energy deviations (differences between produced and programmed energy). In this context, wind energy producers have to predict their hourly resources one day in advance in order to sell their predicted energies in the daily market, and have the opportunity to correct their programmed energies in one of the six sessions of the intraday market. This paper describes the short term (up to 10 hours ahead) wind power forecasting system Apolo, which is in operation in the Spanish electricity market agent Wind to Market S.A. since October 2005. The objective of Apolo is to provide an updated estimation of the production of wind farms in order to manage this energy in the intraday electricity market. For that purpose, nonlinear autoregressive (NARX) models are implemented with Multilayer Perceptrons, taking as inputs the outputs (wind speed, wind direction and energy production) of a physical forecasting system based on the numerical weather prediction model HIRLAM and the last measurements of the generated power in the considered wind farms. Results for wind farms corresponding to different topographies are reported, showing the benefits of the combination of meteorological and statistical models.

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Forward Prices And Their Risk Management Role In The Australian Electricity Market

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M. Peat
The University of Sydney

This study has been concerned with examining the role of forward prices in the Australian electricity market. Forward price estimates were generated from two models as well as a consensus of electricity market operatives. The first of these models was a model that is based on stochastic differential equations that are innovated by Geometric Brownian Motion, while the second was a time series model. To evaluate a forward price estimate, two criteria were utilized in order to conclude appropriateness for use in the marking-to-market process. First was the requirement that the forward price converge to the spot price at expiration of a hedging contract. This is the null under the unbiased expectations hypothesis. The second criterion referred to the mispricing of the forward price estimates over the days leading up to the contract expiration. The ranking of the three alternatives for generating forward price curves was clear. On both criteria the time series model was preferred. Of importance was the lack of support for the consensus (market) forward prices. They did not converge to the spot price at equilibrium and, further, they generated a large overvaluation of the risk management portfolio.

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F2

Contributed session: Forecasting financial time series I

Monday, 05.15pm-06.30pm Room: Biblioteca-P7

Chair: Johhanes Prix
Vienna University of Economics and Business Administration, Vienna

Forecasting Foreign Exchange Volatility

J. Liu, E. Balaban, J. Ouenniche
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This paper primarily aims to evaluate the out-of-sample predictive ability of competing models for the volatility of foreign exchange changes. We compare the out-of-sample forecasting performance of monthly USD/GBP volatility using time series models for the period February 1973 to October 2005. We use both symmetric and asymmetric error statistics. Additionally, we employ a forecast efficiency test. The various model rankings are shown to be sensitive to the error statistics used to assess the accuracy of the forecasts. An overall evaluation shows that non-ARCH class models are superior to ARCH class models. However, ARCH class models take predominance overpredictions are more heavily penalised. We discuss the implications of our results for currency models including option pricing as well ass policy making.

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Modelling and Forecasting financial time series of «tick data»

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Financial time series display typical nonlinear characteristics; it exists clusters within which returns and volatility display specific dynamic behavior. For this reason, we will consider here nonlinear forecasting models, based on local analysis into clusters. Although financial theory does not provide many motivations for nonlinear models, analyzing data by nonlinear tools seems appropriated, and is at least as much informative as an analysis by more restrictive linear methods. In this paper we will present a forecasting method based on an empirical functional analysis of the past of the series. An originality of this method is that it does not make the assumption that a single model is able to capture the dynamics of the whole series. On the contrary, it splits the past of the series into clusters, and generates a specific local neural model for each of them. The local models are then combined in a probabilistic way, according to the distribution of the series in the past. This forecasting method can be applied to any time series forecasting problem, but is particularly suited for data showing nonlinear dependencies, cluster effects and observed at irregularly and randomly spaced times like financial time series of «tick data» do. One way to overcome the irregular and random sampling of tick-data is to resample them at low frequency, as it is done with Intraday. However, even with optimal resampling using say five minute returns when transactions are recorded every second, a vast amount of data is discarded, in contradiction to basic statistical principles.

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Foundations for forecasting the open order book

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The structure of a stock market's entire order book has gained increasing attention from researchers during and since the previous decade. A major reason for this has been the increased availability of relevant data bases. However, a reliable investigation has to be based on a theoretical model. In our presentation, we will apply such a model, implementing cadlag structures for its empirical validation. A major issue in comparing real order book data with simulated data is the fact, that the data exhibit a cadlag feature, allowing to capture the chaotic order book history in a convenient mathematical structure. In this paper we also propose firstly a notion of distance between different states of the open order book and we apply it secondly to evaluate the similarity of real order book data with the simulated data to check the model for forecasting capabilities.Keywords: forecasting, capital markets, market microstructure, open order book.

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EC14

Contributed session: Specification Tests

Monday, 05.15pm-06.30pm Room: C-1

Chair: Daniel Peña
Universidad Carlos III de Madrid, Getafe, Madrid, Spain

A Spectral Approach for Locally Assessing Model Misspecification

S. Holan,
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T. McElroy
U.S. Census Bureau

Peaks in the spectrum of a stationary process are indicative of periodic phenomena, such as seasonality or business cycles. To this end, one important aspect of developing parametric models for periodic processes is proper characterization of spectral peaks. By using an aggregate measure of acceleration, this work proposes to test whether a hypothesized model is locally supported by the data. This technique is useful for detecting model misestimation. More specifically, this method can be used to determine the appropriateness of a hypothesized seasonal adjustment model. Finally, the diagnostic is investigated through simulation and application to several seasonal series.

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Autocontours: Joint specification test for iiid and density functional form, and density forecast.

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In linear and nonlinear models, the error is assumed identical and independently distributed with a specified probability density function. With heteroscedasticity or serial correlation, the generalized error is assumed to be iid. Under normality, it suffices to assess that the error is white noise to conclude independence. In GARCH models with non-normal innovations, the absence of autocorrelation does not imply independence. In ACD models with iid exponential erros, a check of the autocorrelation function is not sufficient to test for iid. We propose a new specification test for iid errors jointly with the specification of their probability density function. Under iid and a parametric density function, the joint density of the errors is the product of the marginals. The specification test is based on the construction of the alpha-% probability contour plot of the product of the marginals and the construction of a binary variable that takes the value 1 if the observation falls inside the contour, and zero otherwise. In the simplest bivariate case for normality, the autocontour under the null is a circle with radius equal to square root of a chi-square with two degrees of freedom for alpha-% probability. We construct several tests based on the binary variable being iid Bernoulli. We construct a t-ratio that has an asymptotic standard normal distribution under the null. For a joint set of Bernoulli variables , we construct a test that is asymptotically chi-square distributed. Size and power are analyzed. Our tests can also be extended to test for symmetry. For financial time series, we apply our testing to the standardized residuals of several GARCH models with non-normal densities and to the standardized durations of several ACD models with exponential and gamma densities. The tests can also be extended for evaluation of density forecasts.

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The log of the determinant of the autocorrelation matrix as a goodness of fit test

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A new test for goodness of fit for time series is presented. The test statistic is the log of the determinant of the autocorrelation matrix. We propose two approximations by using the Gamma and the Normal distributions to the asymptotic distribution of the test statistic. It is shown that, depending on the model and sample size, the proposed test can be up to 50% more powerful than the Ljung and Box, Monti and Hong tests, and for finite sample size is always better previous tests. This test is applied to the detection of several types of nonlinearity by using either the autocorrelation matrixof the squared or the absolute values of the residuals. It is shown that, in general, the new test is more powerful than the oneby McLeod and Li. This test also provides new perspectives on the relation between goodness of fit and model selection.

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TS9

Contributed session: Exponential Smoothing I

Monday 05.15pm-06.30pm Room: C-2

Chair: Bernard Morzuch
University of Massachussets, University of Massachussets, Department of Resource Economics, Amherst, MA

Some optimality conditions of Holt's linear method for the Linear Growth Model

N. Atanackov
Belgrado University, Belgrado

J. Boylan
Buckinghamshire Business School

The optimality of Holt's linear exponential smoothing method for time series following the Linear Growth Model (LGM) will be discussed in this paper from the perspective of forecasting accuracy. It is expected that Holt's method will give more accurate forecasts than Single Exponential Smoothing (SES) and damped Holt's forecasting method regardless of time series length and the length of forecasting horizon. Moreover, the objective of this research is to examine whether the specific values of the smoothing parameters, a and b, influence the optimality of Holt's linear method for the time series that follow the LGM model. Two accuracy measures have been selected for reporting the forecasting results: the Mean Absolute Error (MAE) and the Geometric Root Mean Square Error (GRMSE). An extensive simulation experiment, involving eight different time series lengths and 1-, 3-, and 6-steps ahead forecasting horizons, was conducted. The combinations of parameters used for the LGM time series simulation were divided in two groups: the first group contained combinations of smoothing parameters with low b values, the second group contains combinations with higher b values. Analysing the performance of the universal application of forecasting methods on the LGM time series with low b values it was noticed that the SES produces more accurate forecasts than Holt's method for the series containing up to 20 observations and 1-step ahead forecasting horizon

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A Bayesian analysis of the Holt-Winters forecasting model

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Exponential smoothing methods are among the most widely used forecasting techniques in industry and business. Forecasting competitions have reported the surprising forecasting accuracy of Holt-Winters methods, obtained with minimal effort in computation and model identification. Besides, recent developments provide a class of state space models for which exponential smoothing methods are optimal, this class containing both ARIMA models and dynamic non-linear statistical models. While Holt-Winters methods produce accurate forecasts, they do not provide good prediction intervals. A lot of different formulae have been proposed for obtaining prediction intervals, but simulated and empirical studies have shown that the proposed intervals tend to be too narrow, in the sense that more observations than expected fall outside the prediction intervals. In this work we apply the additive Holt-Winters method and introduce the stochastic component of the model by means of additive, uncorrelated, homoscedastic and Normal distributed errors. The joint distribution of the data vector, giving the unknowns, is then a multivariate Normal distribution. We obtain their moments, mean vector and covariance matrix, as functions of the smoothing parameters and the initial conditions of the series. We then show that the Holt-Winters method can be formulated as a linear heterocedastic model, the Holt-Winters additive forecasting model, whose coefficients are given by the initial conditions, and that its covariance matrix only depends on the smoothing parameters. We proposed a Bayesian analysis of the Holt-Winters forecasting model in order to obtain the predictive distributions and, from them, the point-wise and interval forecasts. The posterior distribution obtained is analytically untreatable but we proposed a simulation analysis that, with a reasonable computational effort, allows us to obtain a random sample from it. We used that random sample to obtain a Monte-Carlo approximation of the predictive distribution. The theoretical results are applied to some univariate time series.

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Forecasting Hospital Emergency Department Arrivals

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Predicting demand for hospital emergency department services is contingent upon the arrival distribution of incoming patients. We focus on one particular hospital's emergency department and its arrival distribution on an hourly basis. Accurate hourly forecasts are important guides for physician and nurse staffing, both of which are major components in health care capacity planning. In a previous study, we forecasted hourly arrivals for each day using standard Holt-Winters (H-W) exponential smoothing methods. We picked up movements in actual arrivals for 168 hours ahead; however, we under-predicted peaks and troughs. Poor predictions were the likely result of not modeling all relevant levels of seasonality. We modeled weekly effects but not daily effects. Likewise, we ignored special events, e.g., holidays. We compare forecasts from standard H-W having either daily or weekly seasonality with: (1) a double seasonal exponential smoothing method that allows the inclusion of one cycle nested within another; (2) an unobserved components approach; and (3) an approach to model a multiple seasonal process. An approach's flexibility should be reflected in improved forecasting performance.

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FM3

Contributed session: Improvements in forecasting III

Monday, 05.15pm-06.30pm Room: C-3

Chair: Miguel Jerez
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The Variability Decomposition approach to transfer function modelling: application in forecasting daily fire incidences in South Wales

H. Al-Madfai, A. Ware, G. Higgs
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Statistical and Artificial Intelligence (AI) Transfer Function time series models aim primarily to build a structure through which a set of inputs explains the variability in a set of outputs. This structure is often extended to utilise historic observations of the output series in the model. In this paper, The Variability Decomposition (VD) approach is developed. VD makes the distinction between Inherent and External variability in time series data. As analytical and empirical verifications of VD are encouraging, a VD based statistical transfer function model and an equivalent AI model are presented. While the statistical VD model is identical in shape to existing transfer function models, but with more pertinent parameters, the AI VD model involves an added step to decompose Inherent variability prior to the exogenous variable identification stage. The VD transfer function model was used in modelling the daily incidences of fire reported to the South Wales Fire and Rescue Service, as a function of ambient conditions, from 1/4/2000 to 1/4/2005. Both statistical and AI VD models were compared to exiting approaches and results show that they produce comparable one-step-ahead forecasts while allowing for superior logical interpretations of the models.

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Model Averaging, Forecasting and Non-stationarity

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Model averaging is widely used in empirical work, in particular in forecasting. However, results on the forecasting performance of model averaging are based on stationary data. This paper considers model averaging when data are non-stationary. Model averaging ensures a constant is included in every single model that is averaged over. However Clements and Hendry (2001) show that it is breaks in such deterministic terms that cause forecast failure. Alternative methods, which take into account breaks in such terms, such as intercept correction through model selection and dummy saturation, and random walk models, are shown to beat model averaging in this context. Monte Carlo simulations support these assertions.

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Just-On-Time Advertising: An Application of Forecasting and Decomposition Methods to the Lydia Pinkham Time Series

M. Jerez, A. García-Hiernaux, J. Casals, S. Sotoca
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This paper discusses the application of time series forecasting and decomposition methods to improve the return of advertising. Our previous assumptions will be: (a) the marketing problem consists of optimizing the expected value of a response indicator (hereafter, "sales") by investing a given budget in advertising, (b) sales are positively affected by advertising and (c) the relationship between both variables over time is log-linear. Under these assumptions we discuss the best timing for investments over the year, taking into account the seasonality and other predictable fluctuations of sales. The discussion is illustrated by a step-by-step practical case based on the monthly sales of Lydia Pinkham's vegetable compound and the corresponding advertising expenditures. After modeling the relationship between both series, we estimate the return of advertising and an independent seasonal factor of sales. Comparing both components revels that this company was an anticyclical advertiser, i.e., investment was systematically increased in the "valleys" of the seasonal cycle and accordingly reduced in the "peaks". A contrafactual forecasting exercise indicates that a procyclical strategy would have yielded a substantially larger return on investment. These ideas define a conceptual framework where several ways of optimizing future returns of advertising can be devised.

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K3

Tuesday 08.30 am-09.30am Room: Paraninfo

Chair: Antonio Garcia-Ferrer,
Universidad Autonoma de Madrid. Spain.

Aggregation, Disaggregation and Forecasting Individual and Aggregate Outcomes: Theory and Applications

Arnold Zellner
Graduate School of Business, U. of Chicago and Adjunct Professor, Department of Agricultural and Resource Economics, U. of California at Berkeley.

In this presentation, I shall briefly review the derivation and structure of the Marshallian Macroeconomic Model. See the International Journal of Forecasting, Dec. 2005 issue for an article describing the origins and variants of this model, some results of forecasting experiments using it and Antonio Espasa's perceptive discussion of the article. Then some past and current simulation and forecasting experiments with the model will be described showing that it's possible to improve forecasts of aggregate variables by disaggregation. In the past, sector models' unrestricted reduced form equations were employed to forecast sector variables and forecasts summed to obtain forecasts of associated aggregate variables. Future use of sector models restricted reduced form equations with and without Stein shrinkage may yield improved forecasts. Some examples will be provided to illustrate these and other general points, namely, how use of sector data and models leads to not only forecasts of sector variables but also improved forecasts of aggregate variables, e.g., aggregate output and inflation, etc. Also, it will be shown how predictive densities for not just one future outcome but a vector of future outcomes, say output growth rates for the next and future time periods can be calculated and used to make joint probability statements regarding future outcomes. Also, some thoughts about how use of quarterly and/or monthly data may improve earlier results based on annual data will be presented. Finally some alternative model-building strategies will be considered with the conclusion that it's best to start simply and complicate if you must all the while keeping everything as simple as possible but no simpler in accord with Einstein's, Jeffreys' , Friedman's and many others' advice.

Arnold Zellner is currently H.G.B. Alexander Distinguished Service Professor Emeritus of Economics and Statistics in the Graduate School of Business, U. of Chicago and Adjunct Professor, Department of Agricultural and Resource Economics, U. of California at Berkeley. His research and teaching over the years have been concentrated on the analysis and solution of theoretical and applied economic, business, statistical, econometric and forecasting problems and on developing and evaluating model-building, forecasting and statistical inference techniques. His research has been published in books and papers in leading research journals and he has been appointed to Fellowship in many leading professional organizations including an Honorary Fellowship in the IIF. In addition, he has received many other honors including three honorary degrees, being elected President of the American Statistical Association in 1991 and Founding President of the International Society for Bayesian Analysis in 1993. His books and papers on Bayesian econometrics and statistics have earned him the reputation of being one of the founders of the current movement to widespread use of Bayesian methods in solving forecasting, decision-making and inference problems in all areas of science. On the model-building front, he and his former student and current collaborator, Professor Franz C. Palm, have developed and applied the structural econometric, time series analysis (SEMTSA) approach that has been shown to be helpful in building models that perform well in forecasting, explanation and policy-making. Recent work along these lines has resulted in attention being paid to aggregation/disaggregation issues and the formulation and implementation of variants of a disaggregated Marshallian Macroceconomic Model. For more information regarding his career, research, publications, etc., please go to:
http://gsb.uchicago.edu/fac/arnold.zellner/more
In addition to his teaching, research and other professional activities, he has been fortunate to have a loving wife, five sons and four grandchildren, a wonderful family that enjoys travel, family meetings, and other activities. He and his wife Agnes have enjoyed knowing so many fine and constructive colleagues and students from all over the world and treasure their friendship.

O8

Invited session: Analogies

Tuesday, 09.45am-11.00 am Room: Riancho-P2

Chair: Tom Yokum
Angelo State University, USA

Structured Analogies: Evidence from Conflict Forecasting

K. Green
Business and Economic Forecasting Unit, Monash University, Wellington

J. Scott Armstrong
University of Pennsylvania, USA

We describe a method for structuring experts' knowledge about similar situations from the past in order to predict what will happen in a target situation. Using our simple judgmental procedure (structured analogies), an expert lists analogies, rates their similarity to the target, and matches outcomes with possible target outcomes. An administrator derives a forecast from the expert's analysis. We tested structured analogies by asking experts to predict the decisions of protagonists in eight real conflict situations. The test was a difficult one: at 32% accurate, unaided experts' forecasts were little better than guessing, by which means one could expect to achieve 28% accuracy. In contrast, 46% of forecasts were accurate when equivalent experts were used in the structured analogies procedure. When experts were able to think of two or more analogies and had direct experience with their closest analogy, 60% of forecasts were accurate.

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Providing reliability information and interaction facilities in a forecasting support system

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Manchester Business School

M. Lawrence
School of Information Systems, Technology and Management, University of New South Wales

Forecasters at UK supply chain companies often employ informal strategies to forecast the effects of sales promotions carried out by their customers, such as supermarkets. An experiment was presented at last year's symposium on the effectiveness of providing a forecasting support system (FSS) that assisted users to identify analogous past promotions and adapt the outcomes of these promotions to produce forecasts. This is a follow-up study which attempts to improve on the previous FSS design. It examines whether providing information on the reliability of the support and enabling user interaction lead to improvements in forecast accuracy and user acceptance respectively. It was found that using reliability information improved forecast accuracy when the noise was low. Interactive support affected forecast accuracy by improving it when the noise was high. Also, providing interactive support improved certain user-acceptance measures, but again only when the noise was high.

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Statistical analogies: Analysis of factors that contribute to forecasting accuracy

T. Yokum,
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Analogies are a popular technique among many judgmental (Green and Armstrong 2004) and technological forecasters (O'Connor 1971, Klein 1986). Their place amongst quantitative statistical techniques is less clear, mainly because of their imprecise and varied construction. The purpose of this research is to expand knowledge concerning the use of analogies as statistical forecasts and investigate which factors lead to forecast accuracy by testing different analysis structures on quantitative time-series data in a simulation. Two simulation analyses are undertaken. They follow previous literature in analogies, first, framing analogies an as average of other series and then second, framing analogies as coefficients of similar models. The simulations use the M-competition database as a target and the averages and coefficients of similar models as the base.

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EC5

Invited session: Forecasting with survey data I

Tuesday 09.45am-11.00am Room: Bringas-P3

Chair: Gabriel Perez Quiros,
Presidencia de Gobierno. Madrid. Spain

How Well Do Business and Consumer Expectations Surveys Predict International Growth Rate Cycles?

Anirvan Banerji
Economic Cycle Research Institute (ECRI)

Data from expectations surveys are typically expressed as percentages of respondents expecting improved conditions. Because such diffusion indexes should correspond to the rate of growth of an economy, we investigate the ability of business and consumer expectations data to anticipate the timing of cyclical turns in economic growth.
The benchmarks used to evaluate the survey data are ECRI's historical growth rate cycle chronologies for the U.S., Germany, Japan, Korea, Australia, China and India, reflecting the dates of cyclical peaks and troughs in economic growth. For each economy, both business and consumer expectations are evaluated as leading indicators of the growth rate cycle.
Granger once warned that, because leading indicators are designed only to forecast the timing of turning points and not the size of forthcoming downswing or upswings, their evaluation by standard statistical techniques is not easy. Accordingly, we used nonparametric methods to test for the statistical significance of their leads at turning points in economic growth.
The results show that business expectations lead growth rate peaks and troughs in the U.S. and Germany, but are coincident in Japan. In Korea and Australia, they lead recoveries in economic growth, but coincide with the beginnings of slowdowns.
Consumer expectations lead growth rate peaks and troughs in Australia but lag them in Korea. In the U.S., Germany and Japan, they are coincident with peaks and troughs in economic growth.
Data for China and India are still sparse. However, both business and consumer expectations appear to lead in India but roughly coincide in China with growth rate cycles.
These results show clear variations in the predictive power of survey data from country to country. While knowledge of these differences should help to improve economic forecasts, the existence of these variations suggests the need for further investigation into their causes.

Discussants:

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O4

Contributed session: Applied forecasting II

Tuesday, 09.45am-11.00am Room: Audiencia de la Reina-P4

Chair: **Ronald Giles**
Economics Dept. Queen Mary. London. England

Applied Forecasting: A Practitioners View

A.Caspers,
Federal Ministry of Economics and Technology, Berlin. Germany

The paper gives an overview of the role, the procedure and the methods for macroeconomic analysis and forecasting in the German government. There are no specific methods stipulated to carry out macroeconomic forecasts. The only regulation according to the German "Stability and Growth Law", in line with international practice is that the projection has to be based on the System of National Accounts (SNA). The forecasting System consists of two major parts strongly interrelated: a core model where all interrelations between economic actors and activities are represented based on the SNA. The satellite models concentrate on specific parts of the economy with crucial importance for the short term economic development. The results of these satellite models form the input for the core model. The core model brings the forecasts of all satellite models together in the framework and the definitional system of national accounting. A variety of different methods is used e.g. correlation / regression analysis, time series approaches etc.. The first step is to scrutinize thoroughly the basic data of the analysis. Then crucial variables of the forecasting system have to be identified; the results of different forecasting method are applied to crucial variables. Judgemental elements have to be introduced at this stage; they concentrate on information not included or represented in the basic data of the statistical analysis of the past e.g. changes in laws, expected variations in behaviour, unique events where no experience in the past exists. Finally in the core model all different results are combined.

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Multivariate structural time series modelling of crime

P. Gould, S. Vujic, S.J. Koopman
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Structural time series models are considered as an alternative to the Box-Jenkins ARIMA models that form the standard time series approach to intervention analysis. In this paper, we build multivariate structural time series models to forecast different types of crime. The multivariate unobserved components models we use allow us to examine the correlations between different types of crime and economic variables. The results of this analysis suggest that parsimonious, reduced-rank models can produce good forecasts and explain variations in the data. Using monthly crime data from the UK and USA, we estimate a range of multivariate unobserved components models in order to test how well reduced-rank models compare with their unrestricted alternatives. We also examine the impact of legislation and economic conditions on reported crime rates using different unobserved components models. We find limited support for a deterrent effect of parole abolition and sentence reform on some crimes. Model performance is assessed according to in- and out-of-sample forecasting performance.

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Trading the weather: noise trader forecasting.

R. Giles
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Weather forecasting models other than for short range have been complex and suspect.A substatial proportion of economic activity is affected by variations in weather patterns.Public quoted companies are now able to hedge against adverse weather conditions. With the advent of weather futures markets and the perceived impact that weather has on financial markets, it seems appropriate to employ some noise trading methodology to weather charts.Comparisons are made as to whether patterns in financial markets and weather can be managed in the same way. This article considers UK and German weather patterns from a noise trader perspective.

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NL1

Contributed session: Nonlinear models

Tuesday 09.45am-11.00am Room: Santo Mauro-P5

Chair: **Catalin Starica**
CTH Mathematical Statistics, Goteborg

Modelling conditional heterokedasticity with smooth time-varying parameters

C. Amado, T. Teräsvirta.
Stockholm School of Economics. Stockholm - Sweden

In this paper, we first propose two parametric alternatives to the GARCH model allowing the conditional variance to have a smooth time-varying structure either in an additive or a multiplicative form. The suggested parameterizations describe both nonlinearity and structural change in the conditional and unconditional variances where the transition between regimes over time is smooth. A generalization of the proposed time-varying GARCH model accommodating more than one transition is also considered. A modelling strategy for the new time-varying specifications is developed. It relies on a sequence of Lagrange multiplier tests, and the adequacy of the estimated models is investigated by a sequence of Lagrange multiplier type misspecification tests. The finite-sample properties of these sequential procedures are examined by simulation. An empirical application to stock return and exchange rate data illustrates the functioning of our modelling cycle in practice.

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The impact of the IGARCH effect on longer-horizon volatility

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The paper investigates from an empirical perspective aspects related to the occurrence of the IGARCH effect and to its impact on volatility forecasting. It reports the results of a detailed analysis of twelve samples of returns on financial indexes from major economies (Australia, Austria, Belgium, France, Germany, Japan, Sweden, UK, and US). The study is conducted in a novel, non-stationary modeling framework proposed in Starica and Granger (2005). The analysis shows that samples characterized by more pronounced changes in the unconditional variance display stronger IGARCH effect and pronounced differences between estimated GARCH(1,1) unconditional variance and the sample variance. Moreover, we document particularly poor longer-horizon forecasting performance of the GARCH(1,1) model for samples characterized by strong discrepancy between the two measures of unconditional variance. The periods of poor forecasting behavior can be as long as four years. The forecasting behavior is evaluated through a direct comparison with a naive non-stationary approach and is based on mean square errors (MSE) as well as on an option replicating exercise.

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Is GARCH as good a model as the Nobel prize accolades would imply?

C. Starica.
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This paper investigates the relevance of the stationary, conditional, parametric modeling paradigm embodied by the Garch(1,1) process to describing and forecasting the dynamics of returns of the Standard & Poors 500 (S&P 500) stock market index. A detailed analysis of the series of S&P returns featured in the illustration of the use of the Garch(1,1) model in estimating and forecasting volatility given in Section 3.2 of the Advanced Information note on the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel reveals that the Garch(1,1) model severely over-estimated the unconditional variance of returns during the period under study. For example, the annualized implied Garch(1,1) unconditional sd of the sample is 35% while the sample sd estimate is a mere 19%. Over-estimation of the unconditional variance leads to poor volatility forecasts during the period under discussion with the MSE of Garch(1,1) 1-year ahead volatility more than 4 times bigger than the MSE of a forecast based on historic volatility. We test and reject the hypothesis that a Garch(1,1) process is the true data generating process of the longer sample of returns on the S&P 500 stock market index between March 4, 1957 and October 9, 2003. We investigate then the alternative use of the Garch(1,1) process as a local, stationary approximation of the data and find that the Garch(1,1) model fails during significantly long periods to provide a good local description to the time series of returns on the S&P 500. Since the estimated coefficients of the Garch model change significantly through time, it is not clear how the Garch(1,1) model can be used for volatility forecasting over longer horizons. A comparison between the Garch(1,1) volatility forecasts and a simple approach based on historical volatility questions the relevance of the Garch(1,1) dynamics for longer horizon volatility forecasting the S&P 500.

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TL2

Invited session: Telecom II

Tuesday, 09.45am-11.00am Room: Infantes-P6

Chair: **Mohsen Hamoudia**
France Telecom

Imitation based forecasting: a new approach to predict the adoptions of innovations.

D.J. Langley, N. Pals
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J.R. Ortt
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Insufficient methods are available to make early forecasts of the market adoption of major innovations. Traditional forecasting methods are based on the underlying principle that past behaviour is a good predictor of future behaviour. However, for major innovations this is a weak assumption because these innovations tend to change behavioural patterns completely. The authors have developed a forecasting instrument which does not rely on this principle. It is based on the idea that the adoption of innovations is predominantly driven by imitation behaviour (the imitation of role models, friends, etc.) The idea of imitation is used in a number of innovation forecasting methods, most notably that of Bass (1969). However, such approaches do not make use of theories of how imitation works and they still require past data to extrapolate or to match curves. Our new approach is based on imitation theories from the behavioural sciences and it estimates the likelihood that a person with particular characteristics will imitate a particular new behaviour. We use this likelihood as the basis for predicting the adoption of innovations. This paper describes how our method was applied in three recent case studies from the mobile phone industry in the Netherlands: broadcast TV on mobile phones, video telephony on mobile phones and a mobile friend-network service incorporating location-based presence information. These cases illustrate how (1) the market segments with the highest potential can be identified, (2) marketing communication can be focused on specific issues important for each segment (e.g. based on the highest imitation potential), (3) product design can be improved (by highlighting the characteristics with the lowest imitation potential) and (4) market demand can be modelled (the overall chance of imitation occurring). The impact of the results on the development of the three services is discussed.

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Identification of time series models : Application to ARMA processes

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In identification of time series, the proposed method combines the usual approach by autocorrelations and a structural approach, less usual, by analysis of oscillators and theory of information, through visualisation by factorial methods (principal component analyses PCA and multiple correspondences MCA). It supplies reference graphic models and pertinent criteria for, identification and estimation of models, and identification of classes. The method was applied to simulated and usual ARMA processes that are stationary and independent. Based on simulated temporal matrices, first PCA produce good quality of processes representation, with significant groupings and oppositions reflecting the eigenvalues symmetric behaviour. However, the main groups of series preserve the samples or the variability of simulated white noises. Directly based on autocorrelation matrices, PCA give better results except for some processes said 'weak'. Groupings and oppositions of series are function of their coefficients whatever the samples: autocorrelations reduce white noises. The first reference graphic models ensue with identification and estimation. Description and measure of possible structural change lead us to introduce oscillators, frequencies and measures of entropy. This is the structural approach. To establish non-linearity between the numerous criteria and to increase the discriminative ability between the processes, classifications on MCA are built over measures of entropy and produce outstanding quality of classes' characterization. The second reference graphic models ensue with the class of 'weak' processes. Therefore, we can project a series in the reference factorial graphics to define the type and estimate the coefficients of an ARMA model. The method with the approaches by the autocorrelations and structural is justified and can be extended to operational data.

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Forecasting the ICT Market using the Simultaneous Multi-Equation Modeling

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The ICT market is probably one of the most evolving and changing markets. In this paper, we apply and evaluate the econometric modeling approach to forecast the whole market of ICT. The model used in this study is based on a system of simultaneous multiple regression equations that expresses a given Telecom variables (Traffic, Sales, Bandwidth, …), and the independent variables as a function of each other plus other explanatory variables. We will show why and how this approach is more adequated to the ICT market in which the majority of the variables are interdependant of each other. This modeling approach is applied and evaluated separately to the Residential and Enterprise markets for a set of western European countries.

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EC10

Invited session: Bank of England Survey of External Forecasting

Tuesday 09.45am-11.00am Room: Biblioteca-P7

Chair: Roy Batchelor
Cass Business School , City of London, UK

The Bank of England Survey of External Forecasters

Kenneth F. Wallis, Gianna Boero, Jeremy Smith
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The Bank of England, since 1996, has asked respondents to its quarterly Survey of External Forecasters to provide density forecasts of inflation at three future points in time, in the form of histograms with pre-assigned bins. Similar questions about GDP growth have been included since 1998. The Bank publishes aggregate results from the survey in its quarterly Inflation Report, and has recently agreed to make available the anonymised individual responses from 39 quarterly surveys for research purposes. This paper provides an introduction to this new source of survey data; to our knowledge, the only comparable data set in existence is the US Survey of Professional Forecasters (originally known as the ASA-NBER survey). Such surveys in particular offer the opportunity of constructing direct measures of uncertainty, in place of the various indirect measures and proxy variables often used in empirical studies. We present a simple statistical framework in which to introduce, and interrelate, direct measures of uncertainty and disagreement, respectively identified as measures of the dispersion of the aggregate and individual forecast densities and the distributions of individual point forecasts. Comparisons of the resulting measures with other direct measures of uncertainty, nationally and internationally, are presented. Methods of evaluating point and density forecasts are extended to the context of forecast surveys.

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Discussants:

R.y Batchelor
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K.l Lahiri
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TS4

Contributed session: Unit roots and seasonality

Tuesday 09.45am-11.00am Room: C-1

Chair: José Luis Gallego
Universidad de Cantabria, Spain

Seasonal Panel Unit Roots in Agricultural Prices: Mean Reversion or Random-Walk Behavior?

R. Kunst, A. Jumah
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Modeling in agriculture frequently has to deal with seasonal behavior. Within a quarterly panel of meat and crop prices for the EU-15 countries for the years 1996-2004, we investigate the nature of seasonal cycles. In particular, we are interested in whether seasonality is mainly deterministic or of the unit-root type. By using a panel, we intend to exploit gains in power with regard to unit-root testing relative to corresponding tests on single time series. To this end, we make use of recent developments in panel econometrics. Several forecasting experiments analyze the important question as to whether the results of the statistical tests are reflected in comparable gains in predictive accuracy.

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An Inverted Beta approximation to a MPI unit root test

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We extend a result of Wood (1989) to a random linear combination of chi-squared variables. The statistic being studied is King (1980)'s small-sample, pointwise, most powerful, and invariant (MPI) test of spherically symmetric versus elliptically symmetric distributions in a unit-root context. References to the latter are Sargan and Bhargava (1983), Bhargava (1986, 1996), and Shively (2001). With no need either for iterative, numerical inversion of the characteristic function or asymptotic theory, the added value of our paper is to approximate the MPI statistic by a marginal density obtained from a mixture of conditional Iverted Beta (IB) densities with a weight function given by an inverted chi-square density. Critical values and powers are supplied. We apply the IB approximation to test the unit root hypothesis to simulated data, to the Nelson and Plosser data set, to the extended Nelson and Plosser data set and to test the Purchase Power Parity in the real Euro/Dollar exchange rate.

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An empirical evaluation of optimal tests for strict noinvertibility

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We examine different extensions of the Nyblom-Makelainen testing statistic for a globally constant mean in the framework of seasonal ARIMA models. Firstly, we derive the testing statistics and their limit distributions following a unified approach. Next, weestimate response surface regressions to compute critical values and p-values based on finite distribution functions obtained by numerical integration. Thirdly, we give some practical guidelines for the implementation of the test procedures. Finally, we conduct Monte Carlo simulations to evaluate how close are the finite distributions to the limit distributions.

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TS10

Contributed session: Exponential Smooting II

Tuesday 09.45am-11.00am Room: C-2

Chair: Anne Koehler
Miami University, USA

A Metric to Assess the Performance of Method Selection Techniques

R. Lawton
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One of the most important issues in exponential smoothing is the question of selecting a suitable smoothing method and several researchers have been using simulated data to evaluate different automatic method selection techniques. The rationale for this is that if a selection technique cannot be shown to work well when we know what the answer should be why should we trust it on real data when we have no real way of assessing whether it has selected the right method or not? However, there are two problems associated with the evaluation of method selection techniques. First, different forecasting methods are capable of producing very similar forecasts. Secondly, there are errors inherent in the model fitting process that inevitably leads to the fitted model having different parameters to those used in the model which generated the series. These errors can be large, especially near the edges of the parameter space where "pile up" can occur. These two problems open up the possibility that a selection technique might choose the wrong forecasting method but also result in a fitted method which is in some sense closer to the true underlying model than that fitted using the correct choice of method. Clearly, as we are interested in producing good forecasts, the measure of closeness between the true model and the fitted method should be related to forecast accuracy. This paper examines the idea of using a metric to establish the extent to which the selection of a given forecasting method leads to a fitted method which is close to the true underlying model used to generate the data. The aim is to investigate whether any of the well known selection techniques is more successful at choosing methods which lead to better forecasts, as opposed to just selecting the correct method.

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Why exponential smoothing cannot be used for long-term forecasting of positive data?

M. Akram, R. Hyndman
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In this paper we discuss exponential smoothing for data that are always positive. Specifically we are interested in situations where the observational sample space is the positive real line. Such cases occur very frequently in business, industry, economics and other fields. We show that some of the single source of error state space models with multiplicative errors defined on the positive real line are not suitable for forecasting such data. We concentrate, particularly, on the case where the error term follows a truncated normal, log-normal or gamma error distribution. Almost all sample paths of these models converge to zero, making them unsuitable for long-term forecasting. We argue that these models are not a natural approach to forecasting positive data, and that they are not suitable for modeling in many situations.Alternative approaches to forecasting positive data will also be discussed

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Incorporating a Tracking Signal into State Space Models for Exponential Smoothing

A. Koehler
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Ralph D. Snyder
Monash University

It is a common practice to complement a forecasting method such as simple exponential smoothing with a monitoring scheme to detect those situations where forecasts have failed to adapt to structural change. It will be suggested in this presentation, that the equations for simple exponential smoothing can be augmented by a common monitoring statistic to provide a method that automatically adapts to structural change without human intervention. It is shown that the resulting equations conform to those of damped trend corrected exponential smoothing. In a similar manner, exponential smoothing with drift, when augmented by the same monitoring statistic, produces equations that split the trend into long term and short term components.

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F4

Contributed session: Forecasting Financial time series III

Tuesday 09.45am-11.00am Room: C-3

Chair: James W. Taylor
University of Oxford, Oxford, UK

Robust Volatility Forecasting with Smooth Transition Exponential Smoothing

Wei-Chong Choo, J. W. Taylor
Wolfson Collage, University of Oxford, Oxford
The presence of outliers can cause undue influence on the modelling, estimation and forecasting of financial market volatility. Most of the existing volatility forecasting methods suffer in this respect, including the widely used GARCH models. This paper investigates the robustness to outliers of the recently proposed method of smooth transition exponential smoothing (STES). This version of exponential smoothing involves the smoothing parameter being modelled as a logistic function of a user-specified transition variable. Although the robustness of STES has been considered for its application to forecasting the level of a series, the robustness has not been considered in the volatility forecasting context. Using simulated and stock index data, we evaluate the post-sample volatility forecasting performance of STES in the presence of outliers. A variety of transition variables are considered in the STES method. We compare performance to standard methods, as well as robust benchmark methods, including Winsorized GARCH models.

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Evaluating Directional Exchange Rate Probability Predictions

A. Pollock, A. Macaulay, M. Thomson
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Dilek Onkal
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The Empirical Probability (EP) technique is proposed as an effective method to evaluate the performance of directional exchange rate predictions obtained from both judgemental and statistical methods. Based on the view that changes in the logarithms of daily exchange rates follow an approximate normal distribution over horizons of 5 days, the proposed technique allows for the presence of primary, secondary, tertiary, and other trends in exchange rates. It is shown that EPs can be obtained for any predictive horizon of 10 days or more (e.g., 180 days) by using a mixture of 5- day Student t distributions over the horizon of interest. The technique is illustrated by deriving overlapping empirical probabilities from daily Euro/USD exchange rate data from 04/01/1999 to 30/12/2005 and applying these probabilities to evaluate the performance of a set of directional Euro/USD predictions.

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Estimating Value at Risk and Expected Shortfall Using Expectiles

J. W. Taylor
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Value at risk (VaR) and expected shortfall (ES) are measures of financial market risk. VaR is a tail quantile of the conditional distribution of returns, and ES is the conditional expectation of the returns that exceed the VaR. In this paper, we avoid distributional assumptions by estimating VaR and ES using asymmetric least squares (ALS) regression, which is the least squares analogue of quantile regression. The ALS solution is known as an expectile. In view of the existence of a one-to-one mapping from expectiles to quantiles, it has been proposed that the theta quantile be estimated by the expectile for which the proportion of in-sample observations lying below the expectile is theta. In this way, an expectile can be used to estimate VaR. We show that the corresponding ES estimator is a simple function of the expectile. As the basis for conditional VaR and ES modelling, we introduce two new classes of univariate expectile models: conditional autoregressive expectiles and exponentially weighted ALS. Empirical results indicate that the new expectile-based methods compare well with the established VaR and ES methods.

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FS2

Featured talk

Tuesday 11.30am-12.45pm Room: Riancho-P2

Chair: Elias Moreno
Universidad de Granada, Spain

Product Attributes and Models of Multiple Discreteness

Greg Allenby,
Ohio State University, USA

The profusion of disaggregate data on consumer demand obtained either from market place observation or surveys has simulated a great deal of work on models with discrete components. Multinomial choice models have been, by far, the most popular models used with disaggregate data. However, these choice models ignore the quantity aspects of demand and can only be applied to sets of goods for which demand is mutually exclusive, i.e. only one good is purchased on each occasion. Consumers are often observed to purchase or select multiple goods on the same occasion while revealing a demand of zero for the vast majority of the available offerings. This data requires a model with a mixture of corner and interior solutions. In addition, when evaluating optimal product assortment and designing new products, it is important to allow for product characteristics or attributes to enter the utility function.
The purpose of this paper is to consider economic models of demand that incorporate product attribute information. The basic utility model is nonlinear and allows for satiation or diminishing marginal utility, and we investigate several different ways of incorporating product attributes both to influence the level of marginal utility afforded by a product offering as well as to influence the rate of satiation. We consider two data sets with product attribute information one created from a field experiment on existing salty snacks with attributes provided by the manufacturer, and another resulting from a "volumetric" conjoint study in which respondents not only choose between alternative offerings but indicate the quantity demanded. We find that our model outperform various ideal point and Lancasterian specifications, with superior predictive performance.

Greg's research focuses on quantitative aspects of marketing, including the development and application of Bayesian statistical methods. He is a Fellow of the American Statistical Association, and is co-author of Bayesian Statistics and Marketing, published by John Wiley & Sons (2005). Greg is an Associate Editor for Marketing Science, the Journal of Business and Economic Statistics, and Quantitative Marketing and Economics. He is also on the editorial boards of the Journal of Marketing Research and Marketing Letters. Within the American Marketing Association, Greg has served as Vice President of the Research Council and chaired the Advanced Research Technique (ART) Forum, a national conference that brings together quantitative researchers from industry and academe. Within the American Statistical Association, he has served as Chair of the Section on Statistics in Marketing. He has authored numerous publications that have appeared in leading marketing and statistics journals.

EC6

Invited session: Forecasting with survey data II

Tuesday 11.30am-12.45pm Room: Bringas

Chair: Gabriel Pérez-Quirós
Presidencia del Gobierno, Madrid. Spain

Improving the quality of business survey data and leading indicators in real time

M. Wildi
Institute of Business Cycle Research, ETH Zürich

Business survey data is often used to improve fore- and/or nowcasts of economic activity. For that purpose, typically a suitable choice of series from different sectors is 'aggregated' to compose a leading indicator. However, the data and therefore the indicator are affected by 'noise' and/or seasonal components which are often undesirable when assessing the state of the business cycle and, in particular, its turning points. Therefore, time series are adjusted for these effects. In a historical perspective, the resulting smooth component (trend) may show evidence of substantial lead in comparison to the reference series (GDP-growth). However, in a practically more relevant real-time setting the intended lead is often partly or completely absorbed in the delay induced by the asymmetry of concurrent real time filters. The paper proposes empirical evidence sustaining this claim in the context of an important leading indicator for Swiss-GDP (the KOF-Konjunkturbarometer). Moreover, it is shown that a new filter design specifically optimized for real time applications may re-establish the lead of otherwise 'lagging' indicators. Empirical comparisons with traditional signal extraction tools are provided.

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Qualitative Business Surveys in Manufacturing and Industrial Production - Is there a Benefit by Looking at the Survey´s Branch Results

K. Abberger
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Business cycle analysts are permanently seeking indicators for the assessment of the state of the economy. A well established instrument for this assessment are business tendency surveys. This article uses German survey results from manufacturing and analyses these results in more detail. It is analyzed, whether the results from some specific branches in manufacturing are especially suited to assess the performance of the manufacturing sector. Four questions will be pursued: 1. Are there branches which are especially suited to obtain early signals? 2. Is it better to use the results of a specific survey question about production expectations or is a more vague question about the economic situation useful? 3. How large are the signal-to-noise ratios of the indicators? 4. Are the branch results also useful for moment-to-moment changes forecasting of the production index? The first three questions are addressed with the help of HP-filtered series and turning point analysis. There are some branch results which tend on average to give earlier signals, but the signal-to-noise ratios of the indicators are lower than in the aggregated indicator. Regarding question 2, the results show that both types of questions have their value. The strengths of the weak question about the business situations are that it gives reasonable results over all branches and that the signal-to-noise ratios are very beneficial. Experience at ifo show that these questions even work well in other sectors of the economy where the cycle should be measured on the basis of other variables than production. The picture is different, when the target series are the moment-to-moment changes of the production index. Analyses based on wavelet decompositions show that qualitative survey results are only useful to forecast the larger scale movements. But this might be a strength and not a weakness of the business tendency survey approach.

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The Calculation of Turning Point Probabilities with the Ifo Business Climate

G. Nerb, Chr. Hott & A. Kunkel
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This work evaluates the predictive value of the Ifo Business Climate especially at turning points of the German business cycle. In sum, we can say that the Business Climate is very useful for turning point predictions. A detailed analysis of the overall Business Climate at turning points shows that the “Three-Times Rule” is well suited to forecast changes of direction of the economic development in Germany. Our calculation of the turning point probabilities support the rule that we have to wait for three consecutive signals to predict a turning point. In addition we identify further combinations of signals that lead to turning point probabilities of well over 50%.

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O5

Contributed session: Applied forecasting III

Tuesday 11.30am-12.45pm Room: Audiencia de la Reina-P4

Chair: L. Vaughan Williams
Nottingham Trent University, Nottingham, UK

Forecasting US GDP: Ray Fair model vs reduced form equation

B. Ivanov,
Microsoft, Sunnyvale

The purpose of this paper is to present an approach for calibrating a reduced form equations model suitable for forecasting the economic business cycle and GDP, in particular. The focus of the paper is a new method for calibrating macroeconomic time series models based on the ARMAX model. A detailed description of the algorithm along with a benchmark of the Ray Fair's model against forecast produced by our approach, for a period of twenty years, is provided. The simulation period is from Q2 1985 to Q1 2005. The benchmarking is based on out-of-sample forecasts produced by models with updated coefficients.The paper shows that across all tested forecast horizons (one, four and eight quarters) the reduced form equations model outperforms Ray Fair's model. The improved accuracy is attributed to the ARMAX model parsimony, functional form selection (data transformations) and, to some extent, moving average/autoregressive terms.

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A Macroeconomic Model for South Africa: A Non-Linear Econometric Modelling Approach

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Econometric models are often made up of assumptions that never truly match reality. One of the most challenged requirements is that the coefficients of econometric models remain constant over time, in the sense that it is assumed that the future will be similar to the past. If the assumption of constant coefficients is not satisfied, any conclusions reached from normal (constant coefficient) models will be biased. Another, very closely related, contested assumption is that the functional form (usually linear) of a model remains unchanged over time. The theory of linearity has long been the centre of all econometric model-building. If linear estimates were not successful in practice, they would have been forsaken long ago, and this has certainly not been the case. Quite the opposite has been experienced: some very influential ideas based on the linear relationships between variables, like cointegration analysis, have been established. Nonetheless, there are definite situations in which linear models are unable to grasp the underlying economic theory of the data accurately. In developing economies like the South African economy, the notion of constant coefficients and the assumption of linearity are far-fetched because these economies are frequently characterized by changes in both the economic policy and the economic structure. It is thus important to see these changes in developing economies as providing valuable information for econometric modelling. Incorporating these changes into models will provide not only better forecasts, but also better information for policy analyses. This study addresses the problem of non-linearity by applying smooth transition autoregressive (STAR) specifications to an existing simultaneous macroeconomic model of the South African economy. The results support the view that non-linear models provide better forecasts than linear specifications of equations.

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Tax, Trust and turnover: a tale of forecasting success?

L. Vaughan Williams
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In July 2000 the UK Government commissioned academic research to forecast the likely impact of various options for taxing betting in the UK. In October 2001, following that research exercise, the UK Government abolished the tax on bookmakers' turnover which had existed since 1966 and replaced it with a tax on the gross profits of bookmakers. Changes to the taxation of financial and sports spread (index) betting and exchange (person-to-person) betting were also introduced in 2001.This paper examines the logic underpinning the academic research and the extent to which the predictions of that research have been borne out in practice.

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NN3

Contributed session: Financial applications

Tuesday, 11.30am-12.45pm Room: Infantes-P3

Chair: John Merkel,
Morehouse College, Atlanta, USA

Premium Changes Effects Using Neural Networks

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C. Perez López
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This paper examines the use of neural networks for modelling insurance customer retention rates within similar groups. The work is part of a data mining framework for determining optimal premium prices. Clustering is used to arrive at similar groups of policy holders based on insurance company's information. This information is supplemented with premium details, and a neural network is used to model termination rates given premium changes. We have shown that significant improvements in prediction accuracy can be obtained by dividing each cluster to isolate those policy holders with a significant increase in premium. The objective is to determine the optimal premium which reflects the risk of the policy holders, the criteria for grouping has to be similarity in risk. The clusters were grouped according to similarity in claim cost.

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Testing the Independent Increments Random Walk Hypothesis in the Greek Stock Market: Learning Technical Trading Rules with Neural Networks

A. Zapranis
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Although, there is an ongoing belief in the investment community that technical analysis can be used to infer the direction of future prices (to some extent), the academic community al-ways treated that belief with scepticism. However, if there is a degree of effectiveness in tech-nical analysis, that necessarily lays in contrast with the efficient market hypothesis, which states that that current market price reflects the assimilation of all the information available. As a consequence, given the information, no prediction of the future price changes can be made. On the other hand, technical analysis, which is essentially the search for recurrent and pre-dictable patterns in asset prices, attempts to forecast future price changes. Because it is based on public information, it should not generate excess returns if markets are operating efficiently. To the extent that the total excess return of a technical trading strategy can be re-garded as a measure of its predictability, technical analysis can be used as a kind of “eco-nomic” test of the random walk version of independent but not identically distributed incre-ments (INID). The relative empirical studies evaluate the profitability of various technical trading systems (e.g., signals generated from the crossovers of two moving averages of different length). In this paper, we use neural network estimators to learn to associate the optimum buy and sell signals for the Athens Exchange (ATHEX) General Index with the levels of a number of lead-ing and lagging technical indicators, such as the stochastic oscillator and the MACD. The profitability of the neural networks based trading strategies in the out-of-sample period is be-ing used here to test the INID hypothesis for the ATHEX General Index.

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Beating the Dow using Artificial Neural Networks

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In his 1991 book “Beating the Dow”, Michael O'Higgins outlines a simple mechanical strategy of picking high dividend yield, low price stocks to outperform the Dow Jones Industrial Average (DJIA). His method selects five stocks from the 30 composing the DJIA, which he argues are poised to outperform the DJIA over the next year. In this study, we use a series of artificial feed-forward neural networks (NN's), trained on O'Higgins' inputs of price and yield, to determine if NN's can outperform the Beating the Dow strategy (BTD). Our methodology uses 10-year windows of data (1981-90 for the 1991 stock selections), with one-year return as the target output, to train each NN. By using windows of data we expect successive NN's will have the ability to adapt to changing relationships between the two inputs. Of particular interest in this study is the performance of the NN pre- and post-BTD discovery (1991). Over years 1976-91, BTD performed exceptionally well, with a compound annual growth rate of 19% vs. 14% for the DJIA. However, over the period 1992-2005 the BTD's high yield, low price strategy performed no better than the market, likely due in part to its popularity and the entrance of large mutual funds devoted exclusively to BTD. Preliminary results show the NN's keeping pace with BTD prior to 1991 and outperforming the strategy post-1991. It appears the NN's emulate BTD in its pre-1991 “glory years”, sometimes overlapping on four of five stock selections, and shy away from the BTD picks post-1991, sometimes picking none of the same stocks. In other words, NN's are able to find new connections between price and yield that are predictive of return precisely when BTD falters. Completed research (March, 2006) will include analysis of years 1976-2005.

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D1

Contributed session: Demography

Tuesday, 11.30am-12.45pm Room: Biblioteca-P7

Chair: Shaid Ullah
Department of Econometrics and Business Statistics, Monash University, Clayton. Melbourne

Predictive applications of the Birth Replacement Ratio

J. Ortega Osona
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Fertility forecasting is particularly interested in getting the number of births right. Most of the approaches currently used are based on modeling fertility rates of different kinds, or modeling period fertility measures like the TFR. Previous approaches often modelled the number of births directly. In this presentation we provide a middle way: forecasting the number of births based on Birth Replacement Ratios (BRR) defined by the ratio between the current number of births and the (fertility) weighted number of births of mother's. This provides a relative measure of birth replacement that can be directy modelled, and that takes into account the effects of migration of the number of births (contrary to fertility rate forecasting). We show how to produce forecasts based on Birth Replacement and a family of unobserved component models. Forecast accuracy is evaluated for models based on forecasting rates, the TFR, births and the BRR.

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Forecasting demographic processes: practice and progress

H. Booth
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The paper provides an overview of approaches and developments in forecasting demographic processes since 1980 using a simple organisational framework. The main processes covered are mortality and fertility. Three approaches are discussed: statistical extrapolation, methods based on expectations (including expectations at the individual level and the informed opinions of experts at the population level), and theory-based structural modelling involving exogenous variables. Cutting across these approaches is the number of factors (age, period and cohort) modelled: zero, one, two or three. Higher-factor models tend to be limited to extrapolation whereas the theoretical and expert-based approaches often use zero-factor models. Decomposition of the demographic process and disaggregation of the population may also be used. Different approaches often produce substantially different forecasts. An important distinction between the four approaches is their ability to forecast change: in theory, extrapolative methods are least able to capture change while structural modelling is designed to do so. In practice, accuracy depends on the particular situation or trends, but it is not clear when a method will perform best. Estimates of uncertainty are obtained by one of three methods: model-based ex ante error estimation, expert-opinion-based ex ante error estimation and ex post error estimation. These cover different sources of error and often produce different estimates. The paper attempts to summarise developments and assess progress.

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Mortality forecasting for a group of populations: A functional data approach

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Functional time series data arise when each observation in a time series consists of a smooth curve. For example, mortality rates are a smooth function of age and are observed annually. We consider the problem of forecasting mortality rates for a group of populations; for example, two sexes, or several regions of a country. We model the populations together to take advantage of similar dynamics and to present non-divergent forecasts of the differences in mortality. Our approach involves extending the general linear model to allow a functional response and grouping factors. A functional F test for choosing between two nested functional linear models is developed. A simulation study is conducted to assess the size and power of the tests. We apply the models to forecasts of male and female mortality in Australia, and also state mortality rates in Australia, and show that the dynamics are highly complex and require models of relatively high order

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TS8

Contributed session: Time series II

Tuesday, 11.30am-12.45pm Room: C-1

Chair: Agustín Maravall
Bank of Spain, Madrid.

Use of the crosscorrelation function of a series and the residual of a proposed ARIMA model as a tool of identification of the correct model

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E. Castaño
Universidad de Antioquia, Medellín. Colombia

The crosscorrelation function of an observed stationary series and the residuals of a proposed ARIMA model is used to confirm a correct identification of a model or as a graphical tool to identify a reasonable model. The proposed procedure is based on the fact that this crosscorrelation function can be expressed in terms of the autocorrelation function of the model generating the observed series. The procedure is illustrated with several real and simulated examples.

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Time aggregation and the Hodrick-Prescott filter

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The time aggregation properties of the Hodrick-Prescott (HP) filter to decompose a time series into trend and cycle are analized for the case of annual, quarterly, and monthly data. It is seen that aggregation of the disagreggate component estimators cannot be obtained as the exact result from applying an HP filter to the aggregate series (and viceversa). Nevertheless, using several criteria, one can find HP decompositions for different levels of aggregation that provide similar results. The approximation works better for the case of temporal aggregation than for systematic sampling. The criterion finally proposed to find close to equivalent HP filters for different frequencies of observation is trivial to apply, and does not depend on the particular series at hand, nor on the series model.

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EC12

Contributed session: Econometrics I

Tuesday 11.30am-12.45pm Room: C-2

Chair: David Harvey
University of Nottingham

Tests for Cointegration and the Initial Condition

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In cointegration analysis it is assumed that the initial values of the cointegrating relations can be given a distribution such that they become stationary and integrated of order zero. We derive a representation of the cointegrated vector autoregressive model in terms of the initial values. We then investigate the asymptotic local power of the likelihood ratio test for the cointegrating rank when the initial value is out of equilibrium. The local power function of the likelihood ratio test is derived under the assumption that the initial condition matters asymptotically. Local power is computed by simulation. It is shown that the power of the test is increasing in the magnitude of the initial condition. In finite samples the likelihood ratio test falsely rejects the null hypothesis of no cointegration if a series contains a stationary component and the initial condition deviates from its mean. A correction factor is proposed. When we study convergence between time series, the initial value of the converging series is out of equilibrium. The practical relevance of the initial value problem is illustrated by an application to price convergence between Estonia and Germany. In the application we discuss how the correction factor can be applied in practice.

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Selection and Validation of State-Space Models to Forecast Fertility

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In this paper we present State-Space models to forecast fertility rates. The models are based in a logistic equation designed to describe fertility schedules with parameters that measures separately the level and pattern effects. The parametrization reduces the number of forecasts and ensures regularity. Several alternatives approaches that use other parametrizations have been proposed in the literature but the method usually consist on several steps: an optional first smoothing step, a second step that gives the estimates of the parameters and a third step where time series models are fitted to the parameter serie(s). The State-Space formulation that we propose in this paper simultaneously gives the estimation of the parameter series and the forecasting values. Also we comment on the selection of initialization values and the formulation of posible candidate models for short term forecast and long term forecast. To validate the procedure we apply the approach to fertility data from several countries. To fit the state-space model we will use the Ssfpack software.

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Multiplicative Combinations of Probability Forecasts and Tests for Forecast Encompassing

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We consider tests of forecast encompassing for probability forecasts based on multiplicative combinations of individual forecasts for both quadratic and logarithmic scoring rules. Procedures based on multiplicative combinations and quadratic scoring provide valid tests of whether a combined forecast encompasses the individual forecasts in circumstances where tests based on linear combinations fail, notably, when forecasts are both biased and correlated. We also consider the impact of parameter estimation uncertainty on tests for forecast encompassing. As an illustration of the usefulness of these tests, we consider whether the SPF respondents' forecast probabilities of output declines incorporate all the useful information in readily available simple leading indicators such as the yield curve.

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FM4

Contributed session: Improvements in forecasting IV

Tuesday, 11.30am-12.45pm Room: C-3

Chair: Seppo Pitkänen,
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Forecasting the Number of Audience of TV Programs: A Bayesian Approach

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Television industry is a fascinating and challenging business in which billions of dollars are invested annually in programs, commercials, equipments and people. A special marketplace exists in this industry. Broadcasters sell television time (in fact, the audience) to advertisers who hope that their advertisements are exposed to the targeted population as widely as possible. However, the audience is a kind of raw material, their viewing patterns have to be studied and analyzed so that broadcasters and advertisers can use the information obtained to increase the effectiveness of television programming and advertising. This paper develops statistical models to forecast the number of audience of TV programs in three stages. First, with People Meter data in Hong Kong, the diffusion patterns of TV programs (the number of new audience in each episode) are examined. A new diffusion model based on hazard rate analysis is proposed. The model fits the empirical data well in terms of MAD, MSE and one-step-ahead forecast. Then the proposed model is implemented with Bayesian approach to obtain early forecast of the number of audience for newly aired programs. Finally, the paper discusses how the Bayesian forecasting procedure can be extended to include exogenous variables and the implications of the models to broadcasters and advertisers.

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A choice-based multi-product diffusion model incorporating replacement demand

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The sales of consumer durables are composed of first time purchases and replacement purchases. Since the sales for most mature durable products are dominated by replacement sales, it is necessary to develop a model incorporating replacement component of sales in order to forecast total sales accurately. Several single product diffusion models incorporating replacement demand have been developed, but research addressing the multi-product diffusion models has not considered replacement sales. In this paper, we propose a model based on consumer choice behavior that simultaneously captures the diffusion and the replacement process for multi-product relationships. The proposed model enables the division of replacement sales into repurchase by previous users and transition purchase by users of different products. As a result, the model allows the partitioning of the total sales according to the customer groups (first-time buyers, repurchase buyers, and transition buyers), which allows companies to develop their production and marketing plans based on their customer mix. We apply the proposed model to the Korean automobile market, and compare the fitting and forecasting performance with other Bass-type multi-product models.

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A System Dynamical Model for Predicting Price Changes of Certain Paper Grades

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The markets of the paper grades under consideration are somewhat specific. There are only a few suppliers, and the most purchases are based on annual agreements. However, spot markets are lively. Price changes seem to depend on a few key variables, and - when modeling the market - a lot of feed-back loops can be easily observed. That is why system dynamics is obviously an appropriate tool for forecasting. After three years` experience, the model seems to work better than moderately.

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F3

Contributed session: Forecasting financial time series III

Tuesday 02.00pm-03.15pm Room: Riancho P2

Chair: W. Van Hyfte
Ghent University and University of Antwerp, Belgium

The Empirics of the Chinese Stock Market

B. Xu,
The University of Edinburgh, Edinburgh, UK

This paper aims to present some empirics for the Chinese stock market. In the first part, I test four hypotheses using daily stock market data from China for the period 1996 to 2004. I employ an AR(p)-TGARCH(1, 1)-in-mean model with the daily dummies. I test the day of the week effects on stock returns and their volatility as well as the return volatility relationship. Time variation and asymmetry in conditional volatility of stock returns is also tested. The evidence suggests that there are day of the week effects only on conditional volatility with no asymmetry and a positive risk-return relationship. In the second part of this paper for which I am still working on, I would like evaluate the out-of-sample forecasting accuracy of ten models for daily volatility in Chinese stock markets. The first 8 years of the sample is retained for the estimation of parameters while the last year is for the forecast period. A wide range of forecasting models are employed, such as random walk, historical mean, moving average, exponentially weighted moving average, exponential smoothing and regression models, symmetric and asymmetric GARCH family models such as ARCH, GARCH, EGARCH and TGARCH. Then I compare predictive ability across models using both symmetric and asymmetric error statistics evaluation criteria.

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Accuracy of Security Analysts' Earnings Forecasts: Distributions Normality and a Comparative Analysis of Distribution Moments in the Development of the Surrogate Consensus

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A wide variety of extant literature on the security analyst earnings forecasts research framework utilises analyst earnings forecasts consensus measures (mean or median) published by Institutional Brokers Estimate System (IBES) to analyse the different characteristics of analysts forecasts. These consensus measures are point estimates of analyst earnings forecasts sample distributions, which are assumed to be normal on grounds of the central limit theorem.This paper aims to challenge this presumption by testing the statistical significance of the deviation of earnings forecasts distribution from normality and corroborate conclusions of such tests with results generated from the use of other data exploratory techniques. There are two benefits in using additional methods of analyses. It allows one to obtain more information about the distribution under examination such as its location, scale/ spread and shape parameters whilst at the same time confirm conclusions derived from significance test results. It is found that analyst earnings forecast sample distributions are non-normal. The subsequent aim is to analyse the diagnostics of these distributions, such as skewness and kurtosis, in order to determine a reliable process that will transform earnings forecast data into a normal form, whereby more accurate consensus measures can then be formulated. If a more accurate consensus measure is found, ensuing implications for extant research literature on specific properties (the accuracy, bias and revisions of individual analyst earnings forecasts relative to a firm's reported actual earnings vis-à-vis the consensus benchmark) and collective properties (forecast dispersion around the consensus forecast or the level of following/ neglect of a company) of analyst earnings forecasts will be wide ranging because statistically significant conclusions previously drawn from the use of IBES published consensus data would have been made on tenuous grounds because the a priori assumed normal distribution is in fact not normal.

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Drivers of Expected Bond and Stock Returns for the Brussels Stock Exchange: Evidence for the 19th Century

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Employing completely new and unique historical asset price data for the Brussels Stock Exchange (BSE), we explore bond and stock return predictability during the nineteenth and the beginning of the twentieth century, a period throughout which the BSE ranked among the largest financial markets in the world. This high-quality database comprises stock price and company related information on more than 1500 companies. The excessive use of U.S. return data in evaluating asset pricing models and the data mining risks involved renders this database an adequate out-of-sample test for examining return predictability and the famous stylized facts that refute the standard theories about the behavior of stock and bond returns. Using a loglinear asset pricing approach combined with a vector autoregression (VAR) framework we model short and long horizon excess bond and stock returns. Our results indicate that stock returns are largely unpredictable from our state vector including variables like the dividend yield or the short rate. Surprisingly but theoretically consistent, dividend yields contain large predictive power for dividend growth rates. High dividend yields forecast lower dividends in the future and, consequently, lower future excess stock returns. In a variance decomposition for excess stock returns we find that almost all variation is attributable to revisions in expectations of future dividends. Excess bond returns are predictable from the term spread refuting the expectation hypothesis for the term structure of interest rates. Moreover, the spread also captures a term premium in long horizon expected bond and stock returns as well as changes in short term interest rates.

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J2

Contributed session: Judgemental and Scenario Forecasting II

Tuesday 02.00pm-03.15pm Room: Bringas-P3

Chair: Kjell Stordahl
Telenor Nordic, Fornebu, Norway

How much does feedback and performance review improve software development effort estimation? An Empirical Study

T. Gruschke, M. Jørgensen
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Over-optimistic and over-confident software development effort estimates are more the rule than the exception. Several software improvement process frameworks, e.g., the Capability Maturity Model, are based on the assumption that improved feedback and use of performance reviews leads to higher degree of realism and better project performance. This paper investigates that assumption, i.e., whether effort estimation and uncertainty assessment skills improve with better feedback processes and mandatory estimation performance reviews. We recruited 20 professional software developers with the necessary technological experience and skill to complete the same 5 software development tasks on an in-use web-system. They were paid standard industry wage corresponding to their level of experience and expertise. Work conditions were like those in industry. Ten of the participants received outcome feedback on their estimation performance and followed our estimation performance review instructions, the other ten acted as a control group with no performance review instructions and only on-the-job feedback. We found no or only minor differences in performance between the treatment groups and conclude that the feedback and performance reviews did not lead to improvement of estimation or uncertainty assessment skill

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Introducing Working Day Effects in Flash Estimations of the German GDP: Judgementally or Econometrically?

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The use of judgmental forecasts is well-established. They can be employed as stand-alone techniques in combinations of Flash estimation systems. If additional information is given pointing to rare or special events judgemental adjustments can be used to correct model estimations. This leaves model parameters unchanged. The alternative to judgemental adjustments is to incorporate the additional information econometrically in the respective equations. This can produce insignificances of other relevant economic variables, that are important to give early signs of changing economic trends. By using encompassing tests the paper shows that the Root-Mean-Squared-errors (RMSE) of predictions of monthly equations without modelling working day differences (first-econometric-round) will significantly be lower, when using the variable of working days in a second econometric equation (second-econometric-round). The results are contrasted with a procedure where judgemental corrections are introduced. In a first stage the correction factor is determined with statistical calculations dependent upon the mean of working day differences over the whole time-series (first-judgemental-round). Judgemental corrections in this technical procedure then adjust to the outcome of the first-econometric-round. The RMSE can further be reduced below the level of the second-econometric-round if correction factors are choosen judgementally with respect to the extent of working day differences (second-judgemental-round

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Long-term broadband demand forecasts and application of the Delphi technique

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Two Pan European Delphi surveys were conducted in 1993-94 and in1997 respectively. The objective of the surveys was to evaluate future broadband services and to make long-term access demand forecasts for the Western European residential broadband market. The first Delphi was a postal survey with 58/50 (first /second round) experts from 10 European counties. The second Delphi survey was arranged on site with 36/32 experts from 16 European countries. Beyond these differences the two Delphi surveys used rather similar approaches. Specific attention is put on the proposed guidelines given by G. Rowe and G. Wright in Principles of Forecasting. Key words for the evaluation are: Selection of experts, number of experts, individual arguments and reasons from the experts, number of rounds and structuring of the questionnaire. The paper discusses some aspects in the proposed guidelines especially based on experiences from the performed Delphi surveys. Futhermore, experiences from the two Delphi surveys and an additional Norwegian Delphi survey on broadband are presented. The last part of the paper evaluates the results of the two Pan European Delphi surveys. The long-terms broadband access forecasts were developed in 1994 and 1997; several years before broadband were introduced in the residential market in Western Europe. Comparisons show that the 2005 broadband residential access forecast of the 1993/94 Delphi survey was 11,3%, while the penetration in Western Europe was 11,4% in 2003.

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O6

Contributed session: Forecasting methods

Tuesday 02.00pm-03.15pm Room: Audiencia de la Reina-P4

Chair: Michal Greszta
National Bank of Poland, Warsaw.

Predicting Chaotic Time Series Using Co-evolution of Models and Tests

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Computer Engineering Department, Sharif University of Technology.

Predicting future behavior of chaotic time series and systems is a challenging area in nonlinear prediction. The prediction accuracy of chaotic time series is extremely dependent on the model and on the learning algorithm, and the generalization property of the proposed models trained by limited observations is of great importance. In the past two decades, neural networks and related MLP networks have been the subjects of interest due to their many practical applications in modeling complex phenomena. In this study a co-evolutionary algorithm is presented for inferring the topology and parameters of a multilayered neural network with the minimum of experimentation to the chaotic systems which will be used as a predictor in predicting such phenomena. The algorithm Predicting future behavior of chaotic time series and systems is a challenging area in nonlinear prediction. The prediction accuracy of chaotic time series is extremely dependent on the model and on the learning algorithm, and the generalization property of the proposed models trained by limited observations is of great importance. In the past two decades, neural networks and related MLP networks have been the subjects of interest due to their many practical applications in modeling complex phenomena. In this study a co-evolutionary algorithm is presented for inferring the topology and parameters of a multilayered neural network with the minimum of experimentation to the chaotic systems which will be used as a predictor in predicting such phenomena.

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Image prediction models based on space-temporal techniques and neural networks

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The need to predict the physical phenomena goes back to immemorial times. Many advances have been done in this field, mainly using numerical prediction techniques. But it has not been like that, in the visual prediction field. This work presents a model based on neural networks to predict the next image of a given sequence. This method can be useful when the image lacks well-defined objects and/or where shapes change with time, such as meteorological pressure maps or satellite imagery. In view of the little usability of standard techniques that calculate the displacement fields in an image, such as optical flow algorithms, since they rely on images with objects that are well defined and with almost constant shape, our models have been designed to forecast each pixel of the image. As the value of a pixel depends not only on its last one but also on its situation in previous instants; a spatio-temporal model is used. in order to recognize the movement of the pixel, neighbouring pixels must be considered. This leads to a neural network architecture where the input layer consists of the values of previous neighbouring pixels. The amount of pixels accounts for the spatial order and the number of previous frames used in the computation accounts for the temporal order of the model. Some results are shown using a standard multilayer perceptron.

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Fan-chart decomposition and central bank monetary policy

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Forecasting inflation and other macro variables is an important aspect of contemporary central banking, especially under inflation targeting. In their communication with the public central banks usually emphasize the uncertainty surrounding the forecasts. The so-called 'fan-charts', composed of probability distributions, have become a popular vehicle for presenting the forecasts along with their uncertainty. There are many possible ways to build fan-charts. The National Bank of Poland runs stochastic simulations of its structural forecasting ECMOD model for that purpose. Fan-charts built on the basis of the ECMOD model take into account uncertainty resulting from exogenous and endogenous variables (i.e. error term of the equations). Magnitude and skewness of shocks to the exogenous variables are given by experts. Error terms in the equations (i.e. endogenous variables uncertainty) are simulated using historical values as in the 'bootstrap' method. This implies that shocks to the endogenous variables have not only the historical magnitude but also the historical cross-correlations. This approach (named fan-chart decomposition) enables to determine the relative importance of uncertainty regarding individual exogenous assumptions and goodness-of-fit of particular equations for the entire forecast uncertainty. Such a distinction is impossible in a number of other methodologies used to generate fan-charts. As we expected, the largest part of inflation forecast uncertainty (within the monetary transmission horizon) comes from food prices uncertainty while GDP forecast uncertainty is mostly determined by distributions of error terms in foreign trade equations

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FM9

Contributed session: Forecasting methods

Tuesday 02.00pm-03.15pm Room: Santo Mauro-P5

Chair: Mario Ziller
Friedrich-Loeffler-Institute, Wusterhausen, Germany

An Optimized Forecast Specification for Economic Activity: An Automated Discovery Approach Using a Genetic Algorithm

B. Brandl,
University of Viena

The fact that non-standard optimisation methods and automated discovery approaches such as genetic algorithms become increasingly interesting and important for forecasting economic activity can be explained by the ever increasing size of data together with the availability of computing power and algorithms to analyse them. Nowadays, a relative high number of survey data is available as well as an increasing number of variables, i.e. leading indicators and cyclical indicators, that are related with economic activity. This phenomenon of increasing availability of data comprises new chances but creates also new challenges. Many traditional quantitative methods for data analysis issues have problems in handling large data sets. On basis of a large number of partially redundant variables it is a non-trivial problem to find a combination of variables that explains economic activity best. Even though literature is aware of the big data problem, non-standard optimisation methods and automated approaches are a neglected area of research in analysing economic activity. Against the background that methods for efficient use of big data sets become increasingly important in applied macroeconomic forecasting literature we presented a forecast model selection approach based on a genetic algorithm which tries to overcome problems of traditional quantitative methods, e.g., factor analysis and artificial neural networks. For the presented forecasting problem we apply a genetic algorithm to illustrate new directions in research for large data sets

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Improving Business Cycle Forecasts' Accuracy - What can we learn from past errors?

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There is a rich literature on forecast evaluation. Nevertheless, it is rarely asked, whether forecasters would have been able to produce a better forecast if making a more efficient use of the information available, a subject addressed as strong information efficiency of forecasts. The paper analyses whether different forecasts for Germany for the years 1991 to 2004 have been information efficient. For that purpose it is tested whether forecast errors covariate with a large number of indicators such as survey results, monetary data, business cycle indicators, or financial data. The analysis is carried out for GDP as well as its main expenditure side components. Given the short sampling period, but also because of data problems, a non parametric testing procedure is applied based on sign tests and ranked sign tests. The study finds quite a number of cases in which forecast errors and the indicators used are correlated, even if mostly at a rather low level of significance. Going more into detail, the study differentiates between two types of errors: Firstly, the forecaster may have neglected some indicators which would have helped him to make a better prediction; secondly, the forecaster may have given too much weight to an indicator. In most cases, an error of the first kind was observed, but there also are prominent cases of the second kind error. Additional tests reveal that there is little evidence of institution specific as well as forecast horizon specific effects. In many cases, co-variations found for GDP are not reflected in one of the expenditure side components et vice versa. This last result is disappointing insofar, as most short term macroeconomic forecast are made bottom up, so that an inefficient use of indicators should shine up in GDP and in at least one of its componenets as well.

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Relative Accuracy and Model Selection in Data-based Prediction

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Data-based prediction is omnipresent in many applications of risk analysis in politics, economics, public health, veterinary epidemiology, bio security, pollution control etc. It means forecasting based on regression methods. The models behind are sometimes explicitly defined. In other cases, as e.g. neural network approaches, they are hidden within the methods. For all these regression tasks, appropriate software has become available estimating the model parameters. Consequence assessments frequently require the prediction of extreme values, too. Worst-case scenarios are essential for cash-flow evaluations, epidemiological emergency control measures and many others. The variance of the estimator influences the accuracy of the prediction of extremes in a particular manner. 'Assessing uncertainty' is therefore one item within the established principles of forecasting. But in data-based prediction, uncertainty has at least two aspects: Uncertainty of the estimation and uncertainty of the model-validity. This paper consequently considers both aspects. Prediction intervals or the variance of the predictive residuals represent absolute measures of the accuracy of prediction, describing the uncertainty of estimation. Although a model may sufficiently describe the underlying dependence within the data-region, no evidence for the validity of the model is given outside this region. For this reason, the relative accuracy of prediction, depending on the model and on the given data set, quantifies the relation between the variances of the model residuals and of the predictive residuals as an additional measure of uncertainty. It implies information about the forecast horizon on which model-validity is being accepted at a given level.

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EN3

Contributed session: Energy III

Tuesday 02.00pm-03.15pm Room: Infantes-P6

Chair: Alain Dessertaine
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Forecasting electricity prices for a day-ahead electric energy market

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This work considers forecasting techniques to predict the 24-market clearing prices of a day-ahead electric energy market. During the last two decades the electricity market has moved from a centralized operational approach to a competitive one. Two instruments are used for trading among power producers and consumers: the pool and bilateral contracts. A bilateral contract is a contract between retailers and producers, where an amount of energy is specified during a given time horizon. In a pool, producers and consumers submit to the Market Operator their production offers and consumption bids, respectively. These offers and bids are submitted for every hour of the market horizon (24 hours a day). The Market Operator uses a market-clearing algorithm to clear the market for every hour of the market horizon. The result of this algorithm is a market clearing price, which is the price to be paid by retailers and consumers and to be charged by producers. We consider a pool that may include bilateral contract arrangements. Producers, retailers and consumers need to forecast market-clearing prices to respond optimally to the pool. Market clearing price forecasting has become an essential tool for producers, retailers and consumers. Price forecasts embody crucial information for producers and consumers when planning offering / bidding strategies in order to maximize their benefits. Three forecasting techniques are considered: Time Series, Artificial Neural Networks and Wavelet Transform

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Estimation of Unbilled Revenues in Natural Gas Distribution Companies: A Statistical Approach

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Revenues of natural gas distribution companies are proportional to the volume of delivered gas. Unfortunately most gas companies are unable to monitor continuously consumptions of all their customers due to technical or economical reasons. An average time period between two adjacent meter readings (as well as invoices) is approximately 12 months for households and small commercial customers. In addition meter readings of all customers are taken at a different time. Hence there is always some amount of natural gas that had been delivered but has not been billed yet. In our contribution we will present a statistical model for estimation of unbilled amount of natural gas. The model has been developed in co-operation between the Institute of Computer Science, Prague (ICS AS CR) and the West Bohemian Gas Distribution Company, Pilsen (WBG) and was implemented into the WBG customer information system. It is a nonlinear regression model which includes an indi-vidual effect related to particular customers and a general part describing the typical customer's be-havior of natural gas consumption. In order to estimate the typical natural gas consumption profiles, customers are classified into 16 groups according to customer category (household, small commercial customer) and the natural gas end-use (cooking, water heating, space heating and technological use). All combinations are consid-ered except technological use in the household category. The typical profile model (so called base model) consists of a time independent part, a time dependent part and a weather correction. The model parameters are re-estimated every 3 months using new data collected by WBG. (The work is supported by the Grant Agency of the AS CR, grant No. 1ET400300513.)

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Survey sampling and time series: An application for the forecast of electricity consumption in EDF (Electricité de France)

A. Dessertaine
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To forecast electric consumption around some periods, such as summertime or at the end of the year, around Christmas, is often difficult. Indeed, in addition to the fact that the profiles of consumption over these periods are very different from the other periods of the year, we can notice that they are often very different from one year to the other, for various reasons: on which days of the week the public holidays are, during these periods, the changes in holidays practices, the socioeconomic developments and so on .A great deal of the differences in consumption over these periods can be explained by some heavy falls in consumption of some industries and some large companies. Therefore, we have worked on a methodology based on the joint use of a random sampling on the one hand and the historical background to the surveyed customers'consumption on the other hand. It includes three stages: a range of samples, a survey and the estimates from the results of this survey and eventually the analysis of the consumption curves. In this presentation, first we will show the broad outline of the methodology that was used, and we will more particularly show how we have built an adequate weighting with an adapted simulation. This one is based on the joint use of estimators calibration and a wavelets decomposition of the consumption signals for each sampled customers and also of the total signal for the whole population.

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O11

Contributed session: Supply change

Tuesday 02.00pm-03.15pm Room: Biblioteca-P7

Chair: Robert Fildes
Lancaster University, UK

The Peloton Forecasting: An Approach for Emerging Technologies

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The RFID industry, that is expected to impact the supply chain landscape, is going through a sea change and at different levels within the industry. Forecasts have been done on different facets of the RFID/EPC industry like the market size or the possible financial returns. However, the forecasts to-date are not based on a collective view on the evolving, dynamic and inter-relating nature of such technology covering Retailers, Suppliers and Industry experts on the same landscape. Our new forecasting methodology called the Peloton Forecasting Tool is developed out of a need to collaborate and form consensus around the events and milestones that are critical for the widespread adoption of Electronic Product Code for the Fast Moving Consumer Goods ("FMCG") industry. The Peloton method, an extended form of Delphi methodology, could be used for any emerging technology where historical data is insignificant and multi-dimensional forces play decisive roles in its evolution. We are at a critical juncture in the history of RFID where there is excitement among stakeholders and the technology's promise needs to be harnessed by providing the stakeholders with a clear idea of (a) where the technology's future lies and (b) how consensus on how to achieve such a future can be facilitated. The Peloton Approach deals with how to identify or develop a technology forecasting methodology that could capture inputs from all dimensions of the industry and lay down a range of possible future paths. To address the latter issue of collaboration, the Peloton aids in identifying the various stakeholders and their stages of adoption and provide a platform for people at a similar level of adoption to collaborate or enable those seeking information to be able to get into the bandwagon.

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On the variability of the lead-time forecast error

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G. Karakostas
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In short-term forecasting and inventory control applications the magnitude of the lead-time demand variability is estimated through the variance of the lead-time forecast errors. Our research focuses on real systems where the steady state model (ARIMA 0,1,1) is a reasonable assumption. (Consequently, an Exponentially Weighted Moving Average - EWMA - is the method used to update estimates of mean demand.) In these cases, and if constant lead-times may also be assumed, the variance of the cumulative lead-time forecast error is, almost invariably, taken as the sum of the error variances of the individual forecast intervals. Such an approach implies independence of the forecast errors over the lead-time, which is inconsistent with the above model formulation. By not taking the auto-correlation term into account we are wrongly stating EWMA's performance, resulting in distorted estimates of the variance of the lead-time forecast error that are misleading regarding stock control decisions. In this paper, three adjusted procedures for calculating the variance of the lead time forecast error, proposed in the literature, are empirically tested and compared against the "standard" approach using real world data. The estimate of demand variability has a significant impact on the safety stock levels. Therefore improvements in this area are expected to have significant cost consequences.

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Systematic errors in forecasting SKU data

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The size and complexity of forecasting at the Stock Keeping Unit (SKU) level, in most companies, necessitates the use of a Forecasting Support System (FSS). The present study reports the findings of a research project examining monthly and weekly demand data and forecasts for SKUs collected from 4 major U.K. companies. Typically, adjustments are made by the company forecasters to take into account events and market intelligence. The paper discusses: a) the accuracy of the judgements and possible explanations for the types of error observed, and b) whether bootstrap models can be developed to explain any systematic components in the errors and thereby improve the companies' forecasts. Differences between the companies were found and some tentative explanations are suggested.

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TS1

Contributed session: Methodology I

Tuesday 02.00pm-03.15pm Room: C-1

Chair: Peter C. Young
Lancaster University, UK

Linear Dynamic Harmonic Regression

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A. García-Ferrer
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P.C. Young
Lancaster University. UK

Among the alternative Unobserved Components formulations within the stochastic state space setting, the Dynamic Harmonic Regression has proved to be particularly useful for adaptive seasonal adjustment, signal extraction, forecasting and back-casting of time series. Here, we show first how to obtain ARMA representations for the Dynamic Harmonic Regression components under several random walk specifications. Later, we use these theoretical results to derive an alternative algorithm based on the frequency domain for the identification and estimation of DHR models. The main advantages of this algorithm are linearity, fast computing, avoidance of some numerical issues, and automatic identification of the DHR model. To compare it with other alternatives, Montecarlo simulations and empirical applications are provided.

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Reusable components for time series modeling: a new implementation of Tramo-Seats

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Using TRAMO-SEATS as a guideline, we have developed an object-oriented software library in the time series domain. While our primary goal is the analysis of economic (discrete) series, the software can be used on similar data in other fields. The algorithms of Gomez-Maravall-Caporello, which are centered on ARIMA modeling and unobserved components estimation, have been split in small reusable blocks and enriched with related features, like structural models and Kalman filters/smoothers. That way, the library provides a versatile framework to tackle a large set of time series problems, including seasonal adjustment, business cycle estimation, outlier detection or forecasting. While the library focuses on univariate time series models, its state space forms framework can also handle multivariate models. The modules, available in .NET and Java, can be easily plugged in any software or development tool that supports one of those standard technologies. While they provide by themselves a large set of features, their object-oriented design has been conceived to allow many user defined extensions. We give in the paper an overview of the contents of the library, with an emphasis on the components related to time series modeling. Our implementation of TRAMO-SEATS, which is the most finished part, is also presented in detail. Finally, we provide some examples that show how to use the library in user defined programs. The set of modules, including a rich graphical interface for TRAMO-SEATS, will be freely available.

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Periodic unobserved cycles in seasonal time series: identification and estimation

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In this paper, we discuss the identification and estimation of periodic unobserved component models and we analyze the characteristics of these models which are formulated as the sum of a stochastic trend, a stationary stochastic cycle, a stochastic seasonal and an irregular component. In our model, all parameters depend on the season of the year, except for the average period of the stochastic cycle. We show that such a periodic unobserved components model cannot be reformulated as a multivariate unobserved components model for the yearly vector representation, commonly used in the analysis of periodic autoregressive models. We derive a convenient state space form for exact maximum likelihood estimation, component estimation, testing and forecasting. We examine the applicability of our theoretical results in Monte Carlo experiments. Finally, we illustrate our methods on a time series for aggregate US unemployment and we discover a clear periodic cycle.

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FM6

Invited session: Forecast combinations

Tuesday 02.00pm-03.15pm Room: C-3

Chair: **Eva Senra**
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Restricted VAR Forecasts of Economic Time Series with Contemporaneous Constraints

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V. M. Guerrero
ITAM, Mexico

This paper presents a methodology to incorporate linear constraints into the forecasts of a multivariate time series when some components of the series are also subjected to contemporaneous constraint. This methodology has natural applications when forecasting macroeconomic and financial time series that must satisfy accounting constraints, which are binding. Besides, the methodology has immediate implications on the forecasts of cointegrated systems because the cointegration relationship can be viewed as a stochastic contemporaneous constraint. An illustrative empirical application considers the balance of payments situation where the deficit (income minus expenditure) is the variable of interest. A Monte Carlo study is also presented to illustrate the use of the methodology to improve the forecasting performance of a vector time series where there is a cointegration relationship.

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Combination forecasts of Spanish inflation through information measures

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The increasing number of prospective sources and methods provides a wide variety of forecasts for a given economic variable. Therefore, the theory suggests the convenience of combining the individual results in order to obtain a single aggregated prediction. The traditional methods for combining forecasts are based on the relative past performance of the forecasts to be combined. However, the number of forecasters has increased considerably in the last years and therefore the available information does not allow to measure the past forecasting ability. This paper focuses on the Information Theory as a framework to combine experts´ forecasts when information is limited. More specifically, we use the principle of Entropy Maximization to obtain a combined forecast from Shannon's measure and we also propose its extension to the quadratic uncertainty measure. The empirical behavior of both procedures is tested over a pool of forecasts referring to Spanish inflation, measured through the one-year percentage change of the Consumer Price Index.

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Assessing consensus and uncertainty through factor models

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The combination of individual forecasts is often a useful tool to improve forecast accuracy. This paper considers factor models to produce a single forecast from several individual forecasts provided by the Survey of Professional Forecasters for the main US macroeconomic aggregates. We find that the first factor is usually a weighted mean of the observations (in this case, the individual forecasts), so with this factor we obtain similar results to the equal weights approach. We also find that the second factor generally provides the differences among the variables and, that it seems to be related with the dispersion in forecasting expectations. Since the common factors are extracted as the principal components of the correlation matrix between the forecasters, we analyze the conditions that this matrix should satisfy to accomplish this empirical fact and test whether they hold for the Survey of Professional Forecasters data.

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FS3

Featured talk

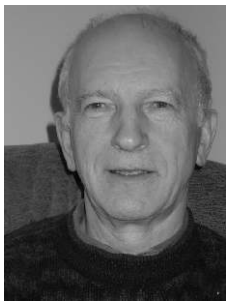
Tuesday 03.45pm-05.00pm Room: Riancho-P2

Chair: Alfonso Novales
Universidad Complutense, Madrid. Spain

Confessions of a Pragmatic forecasters, or Recollections of 40 years in forecasting

Chris Chatfield
University of Bath, Englad.

This talk will present some instructive highlights from a forecasting career that began in 1964 with research directed by Gwilym Jenkins. I use the word 'pragmatic' to mean being 'sensible and practical'. Some early work on the Box-Jenkins forecasting approach proved controversial, while later work on the various versions of exponential smoothing proved more rewarding in many ways. The Holt-Winters method continues to be a good safe way of handling data showing trend and seasonal variation. The latter sources of variation remain key to many problems but are still not as easy to handle as many people expect. Other topics covered will include the construction of prediction intervals, the handling of model uncertainty, publication bias and a discussion of what is meant by a 'best' forecast. Various examples, including consulting problems with real 'messy' data, will be presented. Based on this experience, the talk will reiterate a number of practical recommendations such as the importance of 'looking at the data', understanding the context, using common sense, ensuring that forecast comparisons are 'fair', and preferring simple (but not simplistic) forecasting methods. The talk will also look more generally at forecasting today, and briefly at the future.



Chris Chatfield is Reader in Statistics at the University of Bath, England. An active member of the IIF since its early days, he contributed regularly to the Institute's journals and was also an Associate Editor for many years. He is now an Honorary Fellow of the Institute. He is also a longstanding Fellow of the Royal Statistical Society and is a past Editor of their journal 'Applied Statistics'.He is the author of 5 books, including 'The Analysis of Time Series', now in its 6th edition, and 'Time-Series Forecasting'. As well as time-series forecasting, his interests include all forms of practical problem-solving, especially the difficulties involved in consulting. Not afraid of controversy, he has written some provocative articles over the years, including three editorials in IJoF.

EC9

Contributed session: Macroeconomics

Tuesday 03.45pm-05.00pm Room:Bringas-P3

Chair: Antonio Aznar
Universidad de Zaragoza, Spain

Regions of rationality: Maps for bounded agents

R. Hogarth, N. Karelaia
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Several studies have demonstrated the remarkable predictive ability of simple heuristic models. However, there have been few attempts to understand why and when these models predict well. Arguing that performance is a joint function of characteristics of models and environments, this paper seeks to provide theoretical rationales for the predictive success of different heuristic models. The models investigated involve a single variable (lexicographic), variations of elimination-by-aspects, equal weighting, hybrids of the preceding, and models exploiting dominance. We also consider effects due to whether the models use continuous or categorical (binary) variables. We generalize our earlier work to derive analytically the probabilities that the different models identify the best of m alternatives ($m > 2$) characterized by k attributes ($k > 1$). This reveals the importance of four environmental factors that affect relative performance: how attributes are weighted; characteristics of choice sets; whether attributes are continuous or binary; and error. Moreover, these factors interact in many ways such that numerous patterns of results can be predicted. We illustrate the theory with twenty simulated and four empirical datasets.Errors in predictions rarely exceed + 2% in 540 simulated and 108 empirical predictions. No single model is "best" across all conditions and we document further examples of the "less is more" phenomenon where predictions are more accurate when part of the relevant information is ignored. Furthermore, by regressing performance of models on environmental characteristics we further clarify which models are suited to which tasks thereby providing additional empirical evidence to support the theoretical analysis.
Finally, we suggest areas for further research and also show how our work can be extended to illuminate the effects of different loss functions.

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The economic importance of fiscal rules

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The paper is an empirical assessment of the effects of the Stability and Growth Pact (SGP) on the European fiscal policies. It also looks at the effect of the recently implemented revision of the SGP on the European economy. A set of structural VARs, one for each euro area country, is estimated. The VARs are identified via long run restrictions that are relatively uncontroversial and compatible with most theoretical models of fiscal policy; they also take into account the effect of monetary policy in order to avoid misspecification. The estimated models are then used for assessing the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact both in its old and its reformed version. The investigation highlights some facts. First, fiscal policy has had in the past a limited smoothing effect on the cycle. Second, fiscal policies indeed became more active after entry in the EMU, and the rules of the Stability and Growth Pact have had a limited effect in keeping fiscal discipline. The modified rules of the Pact are likely to give the governments only a limited extra leeway to reduce the variability of the cycle.

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Testing the Fisher Effect and Inflationary Expectations: Which One?

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An empirical test of the Fisher's hypothesis about the impact of inflationary expectations and nominal interest rates requires the availability of the variable that measures inflationary expectations either to define the expected real rate if this variable is the dependent variable or to use it as a regressor. The objectives of the present paper are the following. First, to present a survey of the different proposals made in the literature on how to define and calculate the expected inflation rate. Second, to show that the choice of a particular inflationary expectation can affect significantly the results of the analysis. Finally, we provide some insights on how to make the choice of the inflationary expectations variable when one is testing the Fisher Effect.With respect to the proposals we can distinguish three groups: survey expectations, rational expectations and a mix of both. Survey expectations are obtained by asking economists in universities and private industry for their forecasts of the inflation rate.Rational expectations implies that the expectation is generated using a particular model. A first approach is to assume that the past information of inflation is the only information needed to formulate forecasts on the inflation rate. However, we can assume that the past of other variables are also worth considering and the expectation is derived from the reduced form of an econometric model. It is shown that both the testing procedures and the results are sensitive to the choice made of the price expectation.With respect the guidelines, it is thought that unbiasedness is a necessary condition for rationality. This implies that the expectation of the difference between actual inflation and its forecast given the past relevant information is zero. Operationally, the test for rationality is performed by testing two hypotheses on the parameters of the regression of actual inflation on the forecast.

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FM8

Contributed session: Applications I

Tuesday 03.45pm-05.00pm Room:Santo Mauro-P5

Chair. K. Hubrich
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Reconciliation of hierarchical forecasts in presence of constraints

M.A. Trovero, M.V. Joshi, M.J. Leonard
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Businesses often organize their data in a hierarchical fashion and need forecasts for each level of the hierarchy. The hierarchical structure imposes natural accounting constraints on the data. For example the sum of sales at the store level is equal to the sum of orders at warehouse level. It seems natural to desire that such constraints be respected by the forecasts as well. Additionally, other constraints may also be present on the forecasts. For example, the series may need to nonnegative, or the analyst may want to override some statistical forecasts with judgmental forecasts. It is often either impossible or impractical to generate simultaneous forecasts for the whole hierarchy. Therefore, in most cases, forecasts are generated independently for each node. However, the resulting forecasts do not usually abide by the required constraints. The after-the-fact process through which the constrained are enforced on the forecasts is named reconciliation. Typically, one can reconcile forecasts bottom-up or top-down depending on whether the top or bottom level of the hierarchy is taken as a reference. We present a general framework for reconciliation based on constrained regression that enables to efficiently reconcile a hierarchy of forecasts in presence of linear equality and inequality constraints. The traditional methods of reconciliation follow as particular cases. Another special case is when statistical forecasts are overridden by an expert. Such a case leads to inequality constraints that bound individual forecasts and lends itself to an efficient constrained optimization algorithm.

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PREDICTA

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This one is the prediction module of a product called ERP Wizard that is an application in web, which allows the remote access from any point of the network, with different levels of safety to diverse types of user. The warehouse of information with which there will work the Prediction Module of the ERP Wizard is based on the capacity of the tool for the managing of big volumes of distributed information by good times of response. Oracle, SQL Server Postgress and SQL Server are the used databases and nowadays the storage is implementing with files XML, which was providing a real difference in speed and cost of the solution. From the statistical point of view the Prediction module works with the autoregressive model ARIMAX, used intensively in econometric models for short-term projections. The fact of possessing information updated in line, thanks to the good times of response in the storage added to the dispersion of the process, allows estimate coefficients of impact between the variables of the system in real time. The calculation of the predictors is based on the measurement of the mistake given by the difference between the functions of estimation and the real measurements, in such way that there are chosen such new esteeming that minimize the above mentioned recursive estimation in huge distributed data bases, allows to predict with behaviour.

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Forecasting Economic Aggregates by Disaggregates

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D. F. Hendry
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We suggest an alternative use of disaggregate information to forecast the aggregate variable of interest, that is to include disaggregate information or disaggregate variables in the aggregate model as opposed to first forecasting the disaggregate variables separately and then aggregating those forecasts or, alternatively, using only lagged aggregate information in forecasting the aggregate. We show theoretically that the first method of forecasting the aggregate should outperform the alternative methods in population. We investigate whether this theoretical prediction can explain our empirical findings and analyse why forecasting the aggregate using information on its disaggregate components improves forecast accuracy of the aggregate forecast of euro area and US inflation in some situations, but not in others.

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NN4

Contributed session: Neural Nets Applications II

Tuesday 03.45pm-05.00pm Room:Infantes-P6

Chair: A. J. Owens
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Fine particulate matter forecasting in Santiago, Chile

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Facultad de Ingeniería, Universidad Católica de la Ssma. Concepción, Concepción, Chile

We have analyzed three time series of suspended atmospheric particulate matter with diameter less than 2.5 micrometers (PM2.5) in the city of Santiago, Chile. Each time series corresponds to one hour averages measured in one of the monitoring stations between April and September for years 1994 to 1996. By treating the time series as dynamical systems we have performed two standard tests: Average Mutual Information (AMI) and False Nearest Neighbour (FNN) methods to our databases. We have obtained with the help of the AMI function, an optimum time delay of 7 hours. From FNN we obtained an embedding dimension of 4. But in order to have an input vector with spacing which is a multiple of 24 it was more convenient to choose a time delay of one hour less. With this information we implemented a neural network model having four inputs: one hour average concentration of PM2.5 every 6 hours on a given day, and one output: the concentration at 6:00 AM on the following day. The predictions of this model were compared with values obtained with a persistence model (concentrations at 6:00 AM on a given day are the same as the previous day at the same time). Given that a simple perceptron with linear transfer function is a particular case of multilayer neural network with a sigmoid transfer function (which is a nonlinear algorithm), we were able to generate a comparison between three methods: nonlinear, linear and persistence.We have found that in order of accuracy the three layer network is the best, followed by the simple perceptron and finally persistence. We were able to get a slight improvement of the forecasting by putting more units in the input layer, whether by including data with less spacing or by considering two days of data instead of one.

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A comparison of neural, time series and causal models in tourism forecasting

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This paper consists of a comparison of neural networks, time series and causal models for forecasting tourist arrivals using highly reliable data collected for Japan. A comprehensive analysis is made using the Multi-Layer Perceptron (MLP) neural network model for periodic, partial periodic and non-periodic data. Further, the Adaptive Neuro-Fuzzy Inference System (ANFIS), a hybrid combination of fuzzy logic and neural networks is used to test the influence of fuzzy logic on tourism forecasting, a comparison that has not been done before in tourism studies. In addition to the univariate forecasts, multivariate forecasts are also made using these models with economic indicators as independent variables. Time series forecasts are made using the Autoregressive Integrated Moving Average Model (ARIMA) and the Basic Structural Model (BSM). These forecasts are compared with those of the causal error correction model. The main objective of this study is new in evaluating the forecasting performance of all the most recent models used in tourism, at one time, in order to determine which method is best suited for forecasting tourism. Results of the study indicate that time series models perform best with neural network models also performing well, but the forecasts using regression models were disappointing. The reasons why these models performed at various levels of accuracy, is discussed in the context of forecasting tourism series.

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Predicting River Flow Using Time-Series Methods and Artificial Neural Networks

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The ANNEXG competition requires prediction of the stage of a river as a function of time, based on prior stage at the target and upstream stations as well as rainfall data. There is autocorrelation in the target stage for about 10 lags. There is strong cross-correlation with target stage for all three upstream stages, with lag of 1 or 2. The rainfall measurements have peak lags about 5 and smaller correlation. Linear models (Multiple Linear Regression and Partial Least Squares) are used to evaluate prediction models with various temporal lags. Predicting that the next flow is the same as current gives r^2 = 0.95. Stage values at one prior time predict target stage accurately (r^2 = 0.995 for second train year), and the first year's model accurately predicts the second's data (r^2 = 0.992). The neural network methodology is a feedforward multi-layer perceptron with a single hidden layer. Inputs and outputs are scaled to the range 0.1 to 0.9 using their observed min/max values, allowing for output extrapolation. The training methodology is called Stiff Backprop. The exact equations for minimizing the sum-of-squared prediction error by gradient descent in weight space are solved numerically as a set of coupled stiff ordinary differential equations. The weights for the first neural net model are initialized using Principal Component Regression. After training, in the process of growing the network, the trained weights are kept and small random weights initialize only the new connections as hidden units are added. The optimum number of hidden units is determined with the standard train/test method, training and testing on half the data. The final model is retrained using all training data then makes blind forward predictions for the test year. Results are reported for all requested scenarios.

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O3

Contributed session: M Competition

Tuesday 03.45pm-05.00pm Room: Biblioteca-P7

Chair: Michèle Hibon,
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Forecasting competitions: a suggested procedure for multiple testing

H. Njimi, G. Mélard
Université Libre de Bruxelles, Bruxelles

"Can the results of the M3-Competition help forecasting practitioners select forecasting software?" is a question captured from the paper by Len Tashman (2001). This question is an extension of an original goal of the M-Competition (Makridakis et al., 1982). We recall that in the M3 competition, the latest one, there were 24 competitors. The aim was to determine if one of the forecasting procedures outperforms the other methods based on 3003 time series. In their paper, "The M3-Competition: Results, conclusions and implications", Makridakis and Hibon (2000) tried to answer the question of whether there is a difference in the accuracy of forecasting methods. They draw some conclusions from a vast array of tables and descriptive statistics without giving any statistical tests. Recently, in Koning et al. (2005), several tests were used to examine the M3 conclusions. In particular, the methodology of multiple comparisons was introduced to compare the forecasting accuracy of each method against the best one and against the mean. The McDonald and Thompson (1967, 1972) procedure was used therefore. Contrarily to Koning et al. (2005), we suggest the use of the Romano and Wolf (2005) stepwise multiple testing procedure to compare several forecasting strategies. The methodology will be presented in the context of comparing the forecasting methods to a common benchmark and to decide which strategies actually beat (or are beaten by) the benchmark.

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Model choice: advantages and limitations. Prediction of method performance using Time Varying Parameter Stochastic State-Space model.

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M. Hibon
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The M3 competition has shown that various standard univariate forecasting methods such as damped trend are hard to beat when the data series are heterogeneous. Further progress on forecast improvement can only be achieved through either a new and better method or an approach that effectively selects the method (from a range of alternatives) that best suits an individual series, an approach known as 'individual selection'. It has already been established that the potential exists ex post for improvement. This research examines a sub-set of monthly data from the M3 competition using multiple time origins to examine different ex ante approaches to individual selection to establish whether gains can be made from selection. In particular a Kalman Filter with Stochastic State-Space based approach to selection using Dynamic Linear Regression including past performance and other indicators is evaluated against naive selection (previous best) and perfect knowledge (of the future) criteria.

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Forecasting competition on transportation data

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We are initiating a new forecasting competition on transportation data. Similar in style to the previous M-competitions, this research will require experts in forecasting to practice their techniques on numerous time series. Different in style to the previous M-competitions, the data all pertain to a particular sector: transportation. We shall present the project plan, and would like to interact with potential competitors in the audience to collect ideas and comments on the structure of the competition (what should be the same as the previous M-competitions, and what should be changed due to the particular sector of data).

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TS5

Contributed session: Multivariate models

Tuesday 03.45pm-05.00pm Room:C-1

Chair: G. Athanasopoulos
Monash University, Melbourne

A simple method to identify the dimension of the conditionally heteroskedastic factor model

Y. Hu
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The conditionally heteroskedastic (CH) factor model, due to its parsimony and interpretation, is getting more and more attentions for analyzing multivariate volatility processes. However, the estimation of the CH factor model is very complicated if we try to identify the dimension of the model and the conditionally heteroskedastic model simultaneously. This paper proposed a moment method which is calculated easily to identify the dimension of the CH factor model without assuming the conditionally heteroskedastic model. After identifying the dimension and then extracting the factors, a specific conditionally hetroskedastic model for the factors is estimated. This two-step procedure not only simplifies the estimation but also enjoy the robustness of parametric model. Finally, the properties of the proposed method are illustrated via simulation studies and analysis of financial data.

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Some comparisons on the predictive power of subspace-based state-space models vs. VAR models for VARMA processes

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VAR modelling is a frequent technique in econometrics for assumedly linear processes. However, if the process under study follows a finite-order VARMA structure, it cannot be equivalently represented by any finite-order VAR model. On the contrary, a finite-order state space model can represent a finite-order VARMA process exactly.VAR modelling offers some desirable features such as relatively simple procedures for model specification and the possibility of making a quick and non-iterative prediction-error estimation of the system parameters. For state-space modelling, these desirable features (simple specification, quick and non-iterative estimates) can be obtained through the use of subspace algorithms.Given the previous facts, we test in this paper whether subspace-based state space models can provide better forecasts than VAR models when working with VARMA data generating processes (DGPs). In a simulation study we generate identification samples from different VARMA data generating processes, obtain VAR-based and state-space-based models for each generating process and compare the predictive power of the obtained models. Different specification and estimation algorithms are considered; in particular, a CCA (Canonical Correlations Analysis) subspace algorithm is one of the options studied to obtain state-space models.

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Two canonical *VARMA* forms: Scalar component models versus Echelon form

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In this paper we study two methodologies which identify and specify canonical form VARMA models. The two methodologies are: (i) an extension of the scalar component methodology which specifies canonical VARMA models by identifying scalar components through canonical correlations analysis and (ii) the Echelon form methodology which specifies canonical VARMA models through the estimation of Kronecker indices.We compare the actual forms and the methodologies on three levels. Firstly we present a theoretical comparison. Secondly, we present a Monte-Carlo simulation study that compares the performance of the two methodologies in identifying some pre-specified data generating processes. Lastly we compare the out-of-sample forecast performance of the two forms when models are fitted to real macroeconomic data.

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TS11

Contributed session: Mixing frecuencies

Tuesday 03.45pm-05.00pm Room:C-2

Chair: C. Schumacher
Deutsche Bundesbank, Frankfurt/Main. Germany

Forecasting unemployment in Argentina with different timing intervals for the observations

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The unemployment rates in Argentina are calculated based on information provided by the National Institute of Statistics and Censuses (INDEC, Instituto Nacional de Estadísticas y Censos) through the Permanent Household Survey (EPH, Encuesta Permanente de Hogares) in the main urban aggregates of Argentina. The information was collected twice a year from 1974 to 2002. Since the year 2003, the information has been collected more frequently and published quarterly. In order to provide forecasts for the unemployment rate for every quarter, even those quarters where information was not available before the year 2003, it is necessary to develop a model for the series that consist of the observations at the two different timing intervals. This is achieved by formulating a state space model for the two parts of the series combined. The resulting Kalman filter provides forecasts of future observations and estimates of the components of the model. The unemployment rate in the third quarter of 2005, one of the two periods of the year where information was not available before 2003, is used to judge the forecasting accuracy of the model selected.

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Feed-forward and recursive neural networks in Rainfall-Runoff modeling at daily scale

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This paper aims to simulate potential scenarios in Rainfall-Runoff (R-R) problems at daily scale, mainly pursued for the control and management of water resources, using feed-forward multilayer perceptron (MLP) and Jordan Recurrent Neural Networks (JNN). Our purpose is to investigate the abilities and the limitations of neural networks (ANN) in reproducing R-R temporal dependence, with particular focus on the reconstruction of drought periods where water resources design is needed. Hence, the analysis starts dealing with "controlled experiments", where error-free simulated data are to be reproduced. ANN is, therefore, asked to model, a specific target signal (namely, the mean daily runoff) produced by a linear conceptual model with one/ two reservoirs. Unfortunately, an undesired insuperable discrepancy arises between the network output signal and the target when referring only to traditional MLP and Tapped Delayed Line (TDL) procedure. These inabilities to model long sequences of non-rainy days, are shown by the appearance of persistent plateaus in the modeled daily runoffs, which demonstrate the lack of ANN sufficient 'storage elements' able to catch temporal variability.A possible way to overcome this problem, consists in adopting a recurrent neural network which is able to model a sort of "system memory". In particular, JNN allow to introduce the desired amount of recurrence without incurring into stability problems, typical of other more general architecture.

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Real-time forecasting of GDP based on a large factor model with monthly and quarterly data

C. Schumacher
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Jörg Breitung
University of Bonn and Deutsche Bundesbank

This paper discusses a factor model for estimating monthly GDP using a large number of monthly and quarterly time series in real-time. To take into account the different periodicities of the data and missing observations at the end of the sample, the factors are estimated by applying an EM algorithm combined with a principal components estimator according to the approximate factor model. In Monte Carlo simulations, the small-sample properties of the EM algorithm are discussed. In real-time, due to publication lags of the statistical data, typically missing observations at the end of the sample occur, and we investigate how they affect the estimation accuracy of unobserved monthly observations for quarterly data. Additionally, we investigate the estimation accuracy of the EM algorithm when the monthly and quarterly data is to some extent noisy and limited informative about the common factors. As an empirical application, we estimate monthly German GDP in real-time, using a novel monthly and quarterly dataset consisting of about fifty time series for post-unification Germany. We discuss the nowcast and forecast accuracy of the model and the role of revisions. Furthermore, we assess the contribution of timely monthly data to the forecast performance. The results show that data revisions play only a minor role for forecasting accuracy. Monthly data, that is available more timely than quarterly national accounts data, however, has a considerable impact on forecasting German GDP in real-time.

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F9

Contributed session: Finance I

Tuesday 03.45pm-05.00pm Room:C-3

Chair: Esther Ruiz
Universidad Carlos III, Madrid. Spain

Range-Based Forecast for Daily Exchange Rate Volatility

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Although volatility is at the core of activities in financial markets, the sample path realization of the volatility process is inherently unobservable. Many techniques have been used by both researchers and practitioners to establish volatility proxies. Examples include the traditional close-to-close estimator, the extreme-value estimator (range estimator), etc. Some researchers have found that the range estimator, which equals the difference between the daily highs and lows, is more efficient than some of the more commonly adopted estimators. We have found that the daily highs and daily lows of five exchange rates, U.S dollar vis-à-vis the Australian dollar, Canadian dollar, British pound, Swiss Franc and Japanese yen, are I(1) while the daily range is I(0). Furthermore, it is also found that the daily highs and lows are co-integrated with the 'range' series as the error correction term. The inclusion of range estimator in the co-integration framework has provided a fuller picture of the interactive effects of the daily highs, daily lows and the 'range'. From the practitioners' viewpoint, it is convenient to model and forecast assets' volatility by making use of the information embedded in the range estimator. To illustrate the potential benefits of adopting the range estimator, a naïve model, an autoregressive integrated moving-average model and an error-correction model are employed. Apart from conventional accuracy measures such as MAE, RMSE, we use the Diebold-Mariano (DM), Modified DM and direction of change tests to evaluate their forecasting performance. The implied volatilities extracted from currency options are also compared with the outcome from the models mentioned above.

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Dynamic Correlations and Optimal Hedge Ratios

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The focus of this article is the calculation of minimum variance hedge ratios between the S&P 500 index and either its future, or against the FTSE index. Finding an optimal hedge requires not only knowledge of the variability of both assets, but also of the co-movement between the two assets. To model the dynamic correlations jointly with time varying variances, four different approaches are compared in simulated and real data. The approaches range from classically formulated BEKK-GARCH and DCC-GARCH models to Dynamic Correlation Stochastic Volatility (DCSV), where the latter is estimated both using (exact) MCMC sampling methods and using an approximative quasi-maximum likelihood/single-source-of-error setup. For simulated data, the estimated correlations are compared with the data generating process, resulting in lower variability for the hedge portfolio and a closer approximation to the true correlation from the DGP when the DCSV model is used. A model for the returns from the S&P 500 index together with either futures or the FTSE index is specified, and the performance of the models is compared for their out-of-sample hedge variance and the resemblance between estimated correlations and estimates of realised correlation.

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Do we need so many models for volatilities with leverage effect?

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There is a very large number of models proposed to represent the dynamic evolution of volatilities with leverage effects. In this paper, we compare the statistical properties of some of the most popular of these models when they are restricted to satisfy the stationarity and fourth order moment restrictions.

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P1 **POSTERS**

Tuesday 05.00pm-06.00pm Room:Salón de Baile

Exchange Rate Forecasting with An Artificial Neural Network Model: Can We Beat a Random Walk Model?

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Developing an understanding of exchange rate movements has long been an extremely important task because an ability to produce accurate forecasts of exchange rates has practical as well as theoretical value. The practical value lies in the ability of good forecasts to provide useful information for investors in asset allocation, business firms in risk hedging, and governments in policy making. On the theoretical side, whether a currency price is predictable or not has important implications for the efficient market hypothesis in the foreign exchange market and for theoretical modelling in international finance. Owing to the importance of the movements of exchange rates in our real life, such as financial hedges and investment abroad, this research investigates the possibility of an accurate pattern of the exchange rate movement. The purpose of this research is to carry out an empirical investigation into the extent to which nonlinear econometric models can improve upon the predictability of foreign exchange rates compared to a standard linear model. We will use the artificial neural network approach and employ macroeconomic fundamental variables, including relative money supply, relative income, interest rate differential and inflation rate differential to examine whether or not the artificial neural network model could significantly improve the accuracy of describing the movement of exchange rates and the predictability of exchange rates, especially out-of-sample. The empirical research will focus on the New Zealand exchange rate with the currencies of its major trading partners (Australia and the United States).

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Forecasting Volatility in GARCH Models with Outliers

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The aim of this note is to analyse and analytically quantify the effect of additive outliers in the forecasting of volatility within the context of GARCH models. More specifically, we seek to quantify the effect of two types of Additive outliers, namely Additive Level Outliers (ALO) and Additive Volatility Outliers (AVO) on the forecasting of the conditional variance of the GARCH(1,1) model. To that end, we begin by defining these two types of outliers in the context of the model in question. After, and starting from the ideal, although somewhat unreal, assumption that the parameters of the model, the period in which the outliers take place and their type are all known, we analyse the effects of ignoring such outliers in the point forecast of the volatility (in terms of the mean absolute forecast error). In this way, we obtain an analytical expression that allows us to quantify the "minimum" effects that the ALO and AVO will have over the forecasting of the volatility in a GARCH model. Subsequently, we relax the initial assumption (that is to say, that the parameters of the model are known), and analyse the effects that these two outliers have both on the estimation of the coefficients of the model and on the point forecast of the volatility. One of the main conclusions is that the outliers considered have the effect of considerably increasing this forecast error. However, such an effect reduces over time, in such a way that if the outlier has taken place in a period relatively distant from the moment of the origin of the forecast, then the effects will rarely be significant.

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Forecasting in Communication Engineering

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Signal detection is one of the most important areas of study in communication engineering. Applications of this theory are found in many fields, such as data transmission, radar, sonar, etc. In general, detection applications involve making inferences from observations that are distorted in some unknown manner and thus, efficient algorithms for the recursive computation of the optimal linear estimator of a stochastic signal are required. A common assumption in the detection of Gaussian signals with continuous-time observations is that the correlation functions involved are known. Hence, we use this correlation information in order to propose recursive linear least-squares prediction, filtering and fixed-point smoothing algorithms for a signal process corrupted by an additive white Gaussian noise which can be correlated with the signal. The methodology employed only requires that the correlation functions involved are factorizable kernels and then it is applicable without the assumption that the signal verifies a state-space model. The factorizability condition is not very restrictive since it is satisfied by the most commonly used correlation functions in signal detection

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On the Forecasting Properties of the Alternative Leading Indicators for the German GDP: Recent Evidence

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In this paper we have undertaken a comparison of the forecasting ability of a wide number of alternative composite indicators including the constructed diffusion index indicator. To this date, our study is the most comprehensive one in the terms of the number of the alternative leading indicators for Germany. We explore the forecasting properties of these indicators for the quarterly, semi-annual, and annual growth rates of the real German GDP over the period from 1998:I --- 2004:IV. Incidently, during this period the dynamic behavior of the time series of interest drastically changes. The structural break takes place around the year of 2001, when the Germany economy slipped into the prolonged period of slump in the economic activity that is not over at the moment of writing this article. Consequently, it is of a great interest to investigate whether the so-called leading indicators were able to predict the upcoming stagnation in the German economy.Our main finding is that none of the leading indicators were able to adequately react to the changes in the dynamic properties of the real German GDP. In the post-break period, all the forecasts generated from those models overestimate the growth rates of the reference time series. Nevertheless, we record the ability of some leading indicators (e.g. diffusion indices) to provide greater forecast accuracy over the benchmark models in the pre-break period.

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Mixed models for next-day forecasting of electricity prices: application to the Spanish market case

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Short-run forecasting of electricity prices has become a need for a power generation unit schedule, since it is the base of every profit maximization strategy. In this work a new method to compute accurate forecasts for electricity prices using mixed models is proposed. The main idea is to develop an efficient tool for one-step-ahead forecasting in the future, combining several prediction methods for which forecasting performance has been checked and compared for a very long period of time that includes several years. Also the optimal length of the time series used to build the models is determined. As a novelty, all the methods under study use to forecast the 24 hourly time series of electricity prices (instead of the complete one), which allows to take advantage of the homogeneity of these time series. Numerical results are shown for the market of mainland Spain, but the methodology of building mixed models can be applied to other markets.

Boosting Multi-Step-Ahead Forecasting with Recurrent Neural Networks

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A common problem with time series forecasting models is the low accuracy of long term forecasts. However reliable multi-step-ahead (MS) time series prediction has many important applications and is often the intended outcome, most of the published literature usually considers single-step-ahead (SS) time series prediction. The main reason for this is the increased difficulty of the problems requiring MS prediction and the fact that the results obtained by simple extensions of techniques developed for SS prediction are often disappointing. To improve upon the obtained performance, we can adapt general procedures that were found to enhance the precision of various basic models. One such procedure is known under the name of boosting. Following this idea, we evaluate on MS time series forecasting problems an algorithm for improving the accuracy of recurrent neural networks (RNNs). The improvement is achieved by combining a large number of RNNs, each of them is generated by training on a different set of examples. This algorithm allows concentrating the training on difficult examples but, unlike the original algorithm, by taking into account all the available examples.We study the behavior of our method applied on three time series of reference: a natural one and two synthetic chaotic ones. We compare our algorithm to numerous other methods applied to the same datasets, including local approaches. The experimental results which were obtained on benchmark problems show that boosting recurrent neural networks greatly improve MS forecasting, keeping low standard deviation. The boosting effect proved to be dependent on the presence of long-range dependencies. We find that the local approaches keep their advantage when compared to our method, if enough data are available. If not, our algorithm boosts prediction performance of global approaches relying on RNNs.

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Analyzing neural network models for long term prediction of chaotic data sets

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Forecasting is a controversial issue and it has been expanded in all various fields; from prediction of solar sunspots and financial fluctuations to electro-pneumatic valve actuator in a sugar factory, but the main subject of interest in this paper is rainfall-runoff data set, the aim is not to find the best prediction value but it is to study the models more deliberately in Long term prediction of chaotic behaviors.In this paper I checked the reliability and accuracy of various neural network models applied to experimental time series. Particular attention is devoted to three neural network models: Multi Layer perceptrone (MLP) using the backpropagation learning technique, Time Lag Recurrent Network (TLRN) and Local linear Neuro Fuzzy using the LoLiMoT technique. To examine each of these models I implement and test them with MATLAB and SIMULINK and the time series data used in this study are rainfall-runoff data sets obtained from ISF competition section. Finally the results are compared with each other in order to conclude which one is more reliable.

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Forecasting GDP with Mixed-Frequency Time Series Models: A Case Study for Germany

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Forecasting macroeconomic variables with multivariate time series models face the general problem that the observations tend to be recorded and published at different frequencies. We describe and apply a model for estimating and forecasting VARMA with mixed-frequency data. Subject to computational constraints, the methods can handle any number of variables and frequencies. The approach of the method is to assume that the model operates at the highest frequency in the data. All variables are assumed to be generated, but not necessarily observed, at this highest frequency, and thus produce forecasts of any variable at this frequency. Variables which are observed at lower frequency are viewed as being periodically missing. The Kalman Filter, modified handle missing observations, is used to compute the likelihood function, under normality assumptions, which is maximized with respect to the unknown parameters. The modification basically involves skipping computations in the standard KF which are associated with missing observations. This paper demonstrates for Germany how this model can be used to improve forecasts of GDP growth rates. Furthermore we can produce estimates of monthly GDP forecasts, which economic analysts and business decision makers often want. For comparisons we estimate a stationary ARMA model for the growth rates and a multivariate AR process as a benchmark. With reference to the frequency problem, first we interpolate the GDP at monthly basis, and second, we aggregate the monthly data to a quarterly basis. The other macroeconomic variables are standard in forecasting, as we use consumer prices, real exchange rates and short term interest rates. We compare these models with the forecast performance of the VARMA model which allows handling mixed-frequency. The results show that the forecast performance, in terms of Theil´s U and the Diebold-Mariano-Test, can especially in short and medium run be improved compared to the univariate approach.

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Spanish Population Projections

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This paper looks at projections for the Spanish population by sex and age for the period of 2005 to 2050. These were carried out using forecasts for birth and mortality rates, and migration. Births and deaths are predicted by applying fertility and mortality rates by ages to the existing population. These rates are calculated using two main sources of information. First, a multivariate time series model was applied for the series of variables from the 1970 to 2001 period. The model chosen is a dynamic factorial model with two factors which provides mortality and fertility rates by age and sex until 2050. Second a model was estimated for life expectancy and for a synthetic fertility index. Both sources of information were combined to obtain the forecasts for the rates. The prediction of these rates is based on a sieve bootstrap procedure. A major advantage of this combined approach is that we obtain the distribution functions of the forecasts for mortality and fertility rates for each single age and sex. Immigration rates are predicted by assuming three possible scenarios based on the maximum proportion that immigrants will represent in the Spanish population. With these variables a structure of ages and sex for the Spanish population is estimated using a cohort component model. The results are compared with the population projections carried out by the National Statistical Institute.

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Generalized Dynamic Factor Model + GARCH A New Approach to Multivariate Financial Analysis

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We propose a new model for multivariate analysis of large financial datasets which combines one of the latest developments in factor analysis, the Generalized Dynamic Factor Model (GDFM), with the world-wide used GARCH model. The GDFM+GARCH exploits a dynamic factor decomposition carried out in both the time and the frequency domain - in order to retrieve the common part and the idiosyncratic part of each return series. These components are assumed to present ARCH effects: being ruled out the use of a multivariate GARCH model because of the huge number of parameters, we solve this problem by estimating 2N univariate GARCH models. The forecast for conditional variance is given by the sum of the forecasts relative to the common and the idiosyncratic part. We have the big advantage that, by exploiting the multivariate information embodied in sample covariances, we take into account all the dynamic relations between and within series. Moreover, we improve upon static principal component methods proposed in the financial econometrics literature as our factor model is truly dynamic. In the empirical part of the work we compare the GDFM+GARCH one-step-ahead predictive performance against the performance of the standard univariate GARCH in samples up to 1030 observations, containing up to 475 series and for forecasting horizons up to 50 periods. The comparison is carried out by means of Mincer-Zarnowitz regressions and RMSE evaluation. In order to proxy volatility we make use of squared returns and range, the latter being adjusted by means of both a theoretical adjustment factor and an empirical one, which we retrieve by applying an original procedure. While results on return levels are not significantly different between the GDFM+GARCH and the benchmark, on volatility the GDFM+GARCH model outperforms the standard GARCH in most cases. Results are robust with respect to the different volatility proxies.

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Exploring Time Varying Characteristics of Stocks Betas in Pakistan

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This paper investigates whether systematic risk or as it is commonly called the security beta may differ during bull and bear markets. For this purpose I use the asymmetric beta model which allows the security beta to be different conditioned upon the direction of the market. The securities in this paper are a sample of 30 securities from the Karachi Stock Exchange and the market proxy used is the Six return index which is constructed to reflect the movements of the Karachi Stock Exchange. Both weekly and monthly return data are used as well as different definitions of bull and bear markets to test the sensitivity of the results. From the sample of xx securities beta was found to be significantly different in bull and bear markets for xx of these. However the results seem to be very sensitive, both to the market definition used as well as if weekly or monthly return intervals was used.

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K4
Plenary session

Wednesday 08.30 am-09.30am Room: Paraninfo-P1

Chair: Daniel Peña
Universidad Carlos III. Madrid. Spain.

Global Atmospheric Changes: Statistical trend analyses of ozone and temperature data

George C. Tiao
The University of Chicago

The ozone layer in the stratosphere plays an important role in the life cycle on earth. This is mainly because ozone absorbs the harmful ultraviolet radiation from the sun and prevents most of it from reaching the surface of the earth. In recent years, there has been considerable attention focused on the effect of the release of chlorofluoromethanes on the ozone layer. There has also been an intense interest in global warming due to man-made causes such as the burning of fossil fuels.
In this talk we present findings of an extensive statistical analysis of ozone and temperature data over the last thirty-five years from networks of ground stations and from satellites. The principal objectives of the analysis are (i) to assess trends in ozone and temperature, and (ii) to compare and integrate the estimated trends with predictions obtained from large-scale chemical/dynamical models of the atmosphere. Some statistical issues related to trend detection and analyses will also be discussed. In particular, a general framework will be presented that allows the scientists to assess the duration of time needed to detect changes in trends with given degree of assurance.

George C. Tiao is Allen Wallis Professor of Econometrics and Statistics, Graduate School of Business, the University of Chicago. He earned his BS degree from the National Taiwan University, MBA from the New York University, and Ph.D. from the University of Wisconsin, Madison. Among his many contributions and honors, he is the 2001 winner of the Wilks Memorial Medal of the American Statistical Association, the 2001 winner of the Julius Shiskin Award of the Washington Statistical Society, the founding president of the International Chinese Statistical Association, the founding editor of Statistica Sinica, an elected Fellow of the American Statistical Association and the Institute of Mathematical Statistics, and an elected member of Academia Sinica, Taiwan, and the International Statistical Institute. He has published eight books and more than 120 journal articles. He serves as an advisor to the research department of the central bank of several countries, including Italy, Spain, and Taiwan. He strongly advocates interdisciplinary exchanges and has continually organized annual conferences to promote statist

J3

Contributed session: Judgemental and Scenario Forecasting III

Wednesday, 09.45am-11.00am Room:Riancho-P2

Chair: Michael Lawrence
University of New South Wales, Australia

Restrictiveness and Guidance in Forecasting Support Systems

P. Goodwin, W. Y. Lee
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R. Fildes
University of Lancaster, UK

K. Nikolopoulos
Manchester Business School, UK

M. Lawrence
University of New South Wales, Australia

When used in supply-chain companies, forecasting support systems (FSS) should enable managers to combine their judgments about future product demand with the forecasts of statistical methods in the most efficient way. However, while management judgment can be valuable when it is used to adjust statistical forecasts to take into account special events, other judgmental interventions can be detrimental to accuracy. This is particularly the case when managers read false patterns in the noise associated with a product's demand history. FSS can therefore potentially improve the integration of judgment and statistical methods if they either: 1) restrict the ability of the manager to make inappropriate interventions or 2) provide guidance on the desirability of judgmental interventions in specific periods. An experiment was conducted to assess the relative effectiveness of using restrictiveness and guidance in an FSS. The talk will report on the accuracy of the forecasts resulting from the two approaches and on which approach was judged to be most acceptable by users.

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Forecasting in a familiar environment with an asymmetric loss.

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University of New South Wales, Australia

P. Ayton
City University, London

Most judgemental forecasting experiments use students as subjects undertaking business tasks for which they lack familiarity. We use the forecasting task of estimating how long to allow to travel to University in order to reach the destination by a particular time. In this task setting we provided for either a penalty for late arrival or a penalty for early arrival. The subjects were students from a major London University all of whom, via their travel to University, faced this task each day. Thus the task had high familiarity for them for one loss function condition (penalty for late arrival) and low familiarity for the other condition (penalty for early arrival). For each trial the students forecast the actual travel time and the time they would allow for the trip given the loss function condition they were assigned. We found that task familiarity had an important impact on accuracy when comparing the results with similar experiments carried out using business tasks. Furthermore the difference between high and low achievers was not their accuracy in forecasting the actual travel time but their willingness to not anchor excessively on the forecast when estimating the time to be allowed for the travel. That is the high achievers were those who responded most appropriately to the asymmetry of the loss function. Important lessons for business forecasting are drawn.

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FM5

Contributed session: Applications II

Wednesday 09.45am-11.00am Room:Bringas-P3

Chair: Heather Padula
Ministry of Finance, Canada

Forecasting Industrial Production

P. Rodríguez
Faculty of Economics, University of Algarve

Denise R. Osborn
School of Economic Studies, University of Manchester

Pedro M.D.C.B. Gouveia
ESGHT, University of Algarve

Forecast combination methodologies explore complementary relations between different types of econometric models. The development and growing use of forecast combinations results from the fact that this approach generally presents better forecast performance than several of the individual models on which combinations are based. This paper looks to the application of forecast combinations on seasonally unadjusted Industrial Production data. Linear models (models with deterministic seasonal and seasonal autoregressive components) and more complex models, such as models that capture deterministic nonlinearity (periodic autoregressive models [PAR]) or stochastic nonlinearity (Self Exciting Threshold Autoregressive [SETAR] models) of the series are considered. In this paper, a forecast study is carried out based on 19 models (linear and nonlinear) and 17 procedures to combine the information from these 19 models. For the purpose of our study, seasonally unadjusted monthly industrial production indices (IPI) from 14 countries available from the OECD Main Economic Indicators Database from January 1960 to December 2002 are used. This study reinforces evidence favouring the use of forecast combinations. We consider a large set of individual models and methods of forecast combinations. The advantage of using forecast combinations is particularly notorious when models that present better short-term (<(h/2)) and long-term (>(h/2)) forecasts are employed when forecasting at these forecast horizons, respectively.

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Forecasting joint volatilities: crude oil market and the stock market

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The association between the crude oil market and the stock market cannot be measured by simply computing the correlation of returns on the crude oil price with returns on assets or stock markets: This correlation is almost zero. The impact of the crude oil market on the stock market can be analyzed and forecast, however, using multivariate conditional heteroskedasticity models. We provide theoretical models of bivariate GARCH models, along with the software to fit them to observed bivariate time series. The properties of several models fitted to returns on crude oil prices and returns on stock indices are discussed, and it is shown how the models contribute to understanding the joint behaviour of the crude oil market and the stock market. Furthermore, we discuss the implications of our findings concerning joint volatility forecasts for investors in both markets.

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Forecasting the Real Exchange Rate: How Does the Mean of Several Forecasters Stack Up Relative to Other Popular Methods?

H. Padula
Ministry of Finance, Canada

Forecasting the real exchange rate is an area of macroeconomic modelling that continues to be challenging in terms finding a successful, practical forecasting method. Practitioners of macroeconomic modelling require a method of forecasting the exchange rate that balances accuracy with ease of use. The aim of this paper is to examine a simple method of forecasting the exchange rate, using a published average of several forecasters from Consensus Economics, versus other widely used methods. This paper examines four methods for forecasting the real exchange rate: a Random Walk (RW), Uncovered Interest Parity (UIP), Fundamental Equilibrium Exchange Rate (FEER) and using an average of several forecasters (Consensus Economics). The accuracy of each method in predicting the Canada/U.S. exchange rate is tested using the root mean squared area criterion (RMSE). The goal is to determine which method provides the best practical application for forecasting the real exchange rate.

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NN1

Contributed session: Neural Nets II

Wednesday 09.45am-11.00am Room:Santo Mauro-P5

Chair: Hans. Zimmermann
Siemens AG

Electric Load Forecasting Using Weather Data with a Kohonen Network and Data Mining Approach

B. Gleeson, T. Kechadi
University College Dublin

Electric load forecasting is a task of vital importance in today's world economy. This is because electricity is hugely important in the day-to-day functioning of modern society, and accurate predictions help to ensure the efficient and reliable operation of power plants and overall power systems. Neural Networks (NNs) are one of the main approaches that have been investigated for this task, as they can model the complex relationships between electric load demand and the factors that affect it. These networks have complex structures and use complex learning algorithms in order to perform the task. Furthermore, their success depends on the way a given application is modelled as an NN problem and on the choice of parameter values such as the number of hidden-layers, learning rate, etc. Kohonen Networks (KNs) are a simple type of NN, comprised of just an input layer and output layer that map N-dimensional data to a 2-dimensional space, also known as Self-Organising-Maps. They have also been used in this area of research, but mainly to classify 24-hour load patterns based simply on historical 24-hour load patterns. This paper describes a hybrid approach combining a KN with a data mining technique. The process starts by mapping daily temporal and weather information using a KN. Its resulting output is then analysed by a data-mining technique to forecast daily electric load demand. We will describe the overall approach used to predict daily electric load demand, which consists of data pre-processing, KN structure optimisation, and the data-mining technique used to complement the KN. The system was trained and tested on two datasets, one from an Irish power plant and another from a power plant in Eastern Slovakia. This approach is proven to be very efficient in terms of response time, adaptation, and accuracy of the forecasting.

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The effectiveness of backpropagation as new approach to forecasting problem in manufacturing

A. Bon, J. M. Ogier, A. M. Razali
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The term backpropagation refers to the manner in which the gradient is computed for nonlinear multiplayer networks. There are a number of variations on the basic algorithm that are based on other standard optimization techniques, such as conjugate gradient and Newton methods. The effectiveness of backpropagation network relies mainly on a proper architectural design as well as finding appropriate parameter values by training the network at the same time. We examined implementation of Neural Networks to forecast in manufacturing quality control from eight selected studies and we evaluated about compared with alternative methods, effective validation and learning algorithm. We also examined with network architecture, cost function and squashing function for all studies. We found that five of the studies were both effectively validated and implemented and also supported the potential of backpropagation for forecasting in manufacturing quality control.

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Long Term Forecasting under the Condition of Changing Environments

H. Zimmermann
Siemens AG

Recurrent neural networks allow for forecasting long term developments. In their standard formulation, recurrent neural networks model the dynamics as a superposition of an autonomous and an external driven subsystem. Typically in the past part the external drivers of the system are used to stimulate the model. In the future part the forecast is solely dependend on the extension of the autonoumous subsystem. This is based on the assumption of an unchanging enviroment. Using dynamical consistent neural networks we are able to overcome this simplification of a constant environment. The price we have to pay for this are large neural networks. Their handling shows up to be very different from the standard paradigms in regression.

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T1

Contributed session: Technology Forecasting II

Wednesday 09.45am-11.00am Room:Infantes-P6

Chair: Nigel Meade
Imperial College, London

The Future of Interactive Television

N. Mohammed, Robert Raeside
Napier University, Edinburgh

Information and Communication technologies (ICT) has brought many great technologies, which have a great impact on our day to day living for example telephones, data fax and mobiles. Most of the ICT products have now entered into their second or third generation. Many of these products are now being enhanced with a digital infrastructure. Notable amongst these is television and as an interactive technology the potential is great. In the UK iTV industry is in its infancy and 4 only around million people in U.K have access to iTV services. The up take of this new technology depends on many factors notably the existing infrastructure in the country of adoption, cultural attitude to new technology, radicalism of the technology, ease of use and cost. To investigate the adoption of a new technology the development of interactive television is compared to that of the Internet and WAP and its future considered. Results from survey data collected in Hong Kong, Pakistan and Scotland will be used to examine cultural factors pertaining to the likelihood of adoption and growth models are used to model and forecast future levels of adoption. The models are compared and the most useful for forecasting is selected. Technology trends in different countries such as UK, China and Pakistan are collected from Euro-monitor, which is a Global marketing database. Following from this an attempt to construct a multivariate model of the growth of interactive TV is undertaken. The results of these investigations are reported, however the development of a multivariate model is constrained by the lack of available data on the uptake and use of interactive TV

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A multi-country, multi-generation model of technology diffusion

N. Meade, Towhidul Islam
Imperial College London

It is well known that the diffusion of technological innovation occurs at different rates in different countries and insights into the causes of the differences in diffusion patterns are valuable. We propose a modeling approach designed to answer these questions in the context of the market for cellular telephones. Our multi-country, multi-generation model is designed to exploit the information set available for estimation including both country specific data and the countries' history of adoption of the preceding generation of technology. We include data from 70 countries covering all geographical regions and economic categories with a comprehensive set of economic, cultural and telecommunications variables to allow valid empirical generalization of our findings. In addition to the insight offered by the modeling process, we investigate the accuracy of individual country forecasts using pooled cross-country estimates and non-pooled estimates.

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EC16

Invited session: Statistical Tests in Forecasting

Wednesday 09.45am-11.00am Room:Biblioteca-P7

Chair: Fred Collopy,
Case Westtern Reserve University, Cleveland

Should statistical significance testing be a part of the empirical research program in forecasting?

J. Scott Armstrong
Wharton School of Management, University of Pennsylvania, Philadelphia, PA
USA

With the publication of a detailed application of tests of statistical significance to results from the M3-Competition, the call for a more systematic analysis of such competitions may have been realized. That re-analysis suggested that some earlier conclusions might have been drawn in error and that other conclusions in the literature may be mistaken. In other research communities there has been a dialogue about the value and validity of statistical significance tests. In this panel we will address these issues and consider alternative ways in which the data from large competitions might be understood.

Discussants

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TS6

Invited session: Seasonality I

Wednesday, 09.45am-11.00am Room:C-1

Chair: Stuart Scott
US Bureau of Labor Statistics, USA

Issues in Estimating Easter Regressors Using regARIMA Models with X-12-ARIMA

B. Monsell, D. Findley, K. Wills
U. S. Census Bureau, Washington, USA

The most common moving holiday effect found in U. S. economic flow series is the Easter holiday effect. This study seeks to provide guidance for practical concerns analysts have when including Easter regression effects in regARIMA models for economic time series. We show how many years of data are needed to detect Easter holiday effects with high reliability and generate useful estimates of the Easter effect (ie, estimates that improve the seasonal adjustment). We also examine the performance of the Easter AICC test incorporated into X-12-ARIMA and show (a) how often X-12-ARIMA produces "false positives" (i.e. select an Easter effect when none exists), (b) the impact of March and April outliers on the number of false positives, (c) how often the Easter effect length is misidentified, and (d) how the estimation of trading day effects affect Easter effect detection. We use simulated series with Easter effects constructed to conform to the models assumed by X-12-ARIMA in this study. In addition, we examine some alternate models for Easter effects, specifically those that incorporate Easter Monday into the Easter effect.

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Various Approaches for the Selection of X-12-ARIMA Specs for Seasonal Adjustment

B. Quenneville
Statistics Canada , Ottawa

We essentially ask ourselves if it is possible to speed up the selection of X-12-ARIMA options by an analyst. Given a set of series to be seasonally adjusted, how can we eliminate as much series as possible by using automatic options from the package so that the analyst has only a reduced number of series to analyze? Furthermore, can we add more rules over the statistical rules already available in X-12-ARIMA to eliminate even more series? Our idea is to build on the experience from the Time Series Research and Analysis Centre (TSRAC) staff members, to consolidate their knowledge so that we have a standardize approach for the selection of options that will be more efficient and accurate, to investigate the benefit of automation of some key steps by adding pragmatic rules over statistical rules already available in X-12-ARIMA, and to produce a guide to help new employees to become operational much faster. In this presentation, we will present various approaches from some of the senior analysts form the TSRAC.

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Variance Measures for X-12 Seasonally Adjusted Level and Change: Some New Results

S. Scott, D. Pfeffermann, M. Sverchkov
US Bureau of Labor Statistics

Each month the U.S. Commissioner of Labor Statistics must assess significance of change in employment and unemployment statistics for the Joint Economic Committee of the U.S. Congress. Along with the basic measure of variance for an estimate of level, this paper will present two methods for estimating the variance of change in a series that is seasonally adjusted using the X-11 (X-12) method. The methods build from Scott, Sverchkov, & Pfeffermann (2004) and have wide applicability. They will be illustrated using real series and simulation experiments derived from a household survey, the U.S. Current Population Survey (CPS), and an establishment survey, the Current Employment Statistics (CES) program. Extensive use is made of estimates of sampling error variances and autocorrelations. This is especially important for series from the (CPS), which has sizable autocorrelations at lags up to 12 months and beyond. CES employment series are based on a ratio estimator, similar to many index formulas, which requires special considerations.

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EC11

Invited session: Forecasting Spanish Economics Indicators

Wednesday 09.45am-11.00am Room:C-2

Chair: Enrique Quilis
Instituto Nacional de Estadística, Madrid. Spain

Forecasting Spanish short-term indicators using factor models

I. Arbués, P. Revilla
Instituto Nacional de Estadística, Madrid

This paper evaluates alternative methods for forecasting Spanish industrial short-term indicators. We assess the possibility of improving univariate ARIMA forecasts obtained through the Box-Jenkins methodology by using both approximate and exact factor models. For this purpose different forecast horizons are considered. We also compute forecasts using simultaneous values of other variables. This situation arises when some indicators are obtained in advance. It is particularly useful in data editing carried out by statistical institutes, when the forecasts are used for detecting survey errors

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Forecasting the Spanish consumer price index using subspace methods

F. Aparicio-Pérez
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V. Gomez, A. Sanchez-Avila
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In the time series literature recent interest has focused on the so called subspace methods. These techniques use canonical correlations to estimate the system matrices of an ARMAX model expressed in state-space form. In this article, we use subspace methods to forecast the Spanish consumer price index with the help of three exogenous variables related to it. We compare the results with those obtained using a traditional transfer function model and present the conclusions

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Multivariate modeling of seasonal time series and its role in the compilation of the Spanish Quarterly National Accounts

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In this paper I consider two types of multivariate models specially adapted for representing multiple seasonal time series: Bayesian Vector of Autoregressions (BVAR) and multiplicative Vector of Autoregressions and Moving Averages (VARMA). The linkage between them is discussed from a theoretical as well as from an empirical point of view, emphasizing their complementary relationship. Both models are used to analyze the dynamic interactions between two monthly indicators used in the compilation of the Spanish Quarterly National Accounts (QNA). By means of meaningful linear transformations of the data based on canonical and principal component analysis using the BVAR and VARMA models as the underlying parameterization, the temporal disaggregation and extrapolation of QNA data is improved, allowing for better monitoring and quality reporting.

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F8

Contributed session: Finance II

Wednesday 09.45am-11.00am Room:C-3

Chair: Menelaos Karanasos
Brunel University, Business School, Uxbridge.UK

Forecasting Oil Price Movements Exploiting the Information in the Futures Market

A. Coppola
Warwick Business School, Coventry, UK

The paper proposes a forecasting model of daily West Texas Intermediate crude oil price movements that employs the information embedded in the futures market. I use a cost-of-carry model to motivate estimation of the long-run relationships between spot and futures prices. The basic idea of this line of research is that if the relation between spot and futures prices shows a long-run equilibrium, short run deviations from this equilibrium will be countervailed by a certain degree of mean reversion in the spot/futures basis. After having detected the existence of this long-run equilibrium between spot and futures prices, I used the information implied by the cointegration links to forecast oil price movements. In order to do this, I used a Vector Error Correction (VEC) Model where the deviations from the long-run relationships between spot and futures prices play the part of the equilibrium error. The forecast performance of the VEC Model has been evaluated in comparison with that one provided by a Random Walk (RW) Model. Using approximately last 20 years of U.S. EIA daily data on spot prices and futures prices relative to four contracts with different time-to-maturity (1,2,3,4 months) I find that: (i) in sample, the information in the futures market can explain a sizeable fraction of oil price movements; (ii) out of sample, the VEC Model is able to beat the RW Model, both in terms of point forecasting (as far it is concerned spot prices and futures prices with shorter time-to-maturity) and in terms of market timing ability (considering futures prices with longer time-to-maturity).

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Modelling and Forecasting Temperature Based Weather Derivatives

J. Svec, M. Stevenson
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The temperature-based Weather Derivative market in Australia is largely illiquid. One of the barriers to enhancing liquidity in this market is the uncertainty surrounding the pricing of these derivatives. With the aim of reducing the uncertainty in mind, this study reviews both time-series and stochastic approaches to modelling prices, and settles on time-series models to forecast the Sydney accumulated cooling degree day (CDD) and heating degree day (HDD) index levels. Two daily and one intraday models are proposed based on a Fourier Transformation of temperature, as well as a wavelet reconstructed Fourier Transformation. All models are compared to a current weather index pricing model and a naïve benchmark model. The results suggest that, overall, the HDD index forecast is superior to the CDD index forecast and that the proposed models show a slight forecast improvement over the current model and benchmark

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The volume-volatility relationship and the opening of the Korean stock market to foreign investors after the financial turmoil in 1997.

M. Karanasos, J. Kim, A. Kartsaklas
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This paper investigates the stock volatility-volume relation in the Korean market for the period 1995-2001. Previous research examined the impact of liberalization on the Korean stock market up to the period before the financial turmoil in 1997 although the crucial measures of the liberalization were introduced after the crisis under the International Monetary Fund program. One of the major features of the reformation was the financial opening to foreign investors. In this study the `total' trading volume is separated into the domestic investors' and the foreign investors' volume. By doing this the information used by two different groups of traders can be separated. Further, in addition to the absolute value of the returns and their squares we use the conditional volatility from a GARCH-type model as an alternative measure of stock volatility. The following observations, among other things, are noted about the volume-volatility causal relationship. First, for the entire period there is a strong bidirectional feedback between volume and volatility. In most cases this causal relationship is robust to the measures of volume and volatility used. Second, volatility is related only to `domestic' volume before the crisis whereas after the crisis a bidirectional feedback relation between `foreign' volume and volatility begins to exist. In other words, `foreign' volume tends to have more information about volatility in recent years, which suggests the increased importance of `foreign' volume as an information variable.

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FS4

Featured talk

Wednesday 11.30am-12.45pm Room: Riancho-P2

Chair: Agustin Maravall
Banco de España, Madrid. Spain

Peter C. Young
Lancaster University.

Data-based Mechanistic Modelling and Environmental Forecasting

Unlike many areas of application, where `black-box' models provide the basis for forecasting, environmental scientists normally approach forecasting as part of `data-assimilation', using models that have a direct mechanistic interpretation. Unfortunately, such models are often quite large, deterministic, simulation models with many parameters. Consequently, they suffer from problems of over-parameterization and poor identifiability, making them far from ideal for forecasting purposes, where parsimony and identifiability are definite advantages. One approach in these circumstances is to use computationally intensive Bayesian numerical methods, with prior parameter distributions that restrict parameter values to regions of the parameter space that are considered acceptable from a physical standpoint. This paper will review an alternative, computationally efficient, adaptive forecasting procedure, based on the author's Data-Based Mechanistic (DBM) approach to modelling stochastic, dynamic systems. As its name implies, DBM modelling is inductive, in contrast to the hypothetico-deductive methods that underlie most environmental simulation modelling, and it produces identifiable, parsimonious models that are in an appropriate form for use in forecasting applications. A priori assumptions about the nature of the model are kept to a minimum, under the assumption that the system can be modelled within a widely applicable, generic model class, such as differential equations or their discrete-time equivalents. Advanced recursive statistical methods, such as optimal Instrumental Variable estimation, are then employed to identify and estimate the model from the available data. However, this estimated model is not considered acceptable unless it can be interpreted in physically meaning terms that are acceptable from an environmental standpoint. If it is acceptable, this stochastic, dynamic model then forms the basis for on-line, real-time adaptive forecasting, using a forecasting engine, such as the Kalman Filter or a nonlinear equivalent of this. This approach to DBM modelling and forecasting is illustrated by a number of practical environmental case studies. These include an interesting global climate example and two rainfall-flow modelling and forecasting studies. The first of these investigates the nonlinear relationship between daily rainfall and flow in the Leaf River, Mississippi, USA; while the second reports recent results on the River Severn in England that have been obtained as part of the large research programme being carried out by the Flood Risk Management Research Consortium (FRMRC) in the U.K. Rainfall-flow modelling and flood forecasting provides an interesting practical example because the physical processes involved are nonlinear and the measurement noise tends to be heteroscedastic.

Peter Young obtained B. Tech, M.Tech degrees from Loughborough University, UK in 1962 and 1965; and MA, Ph.D degrees from University of Cambridge, UK in 1970. He is a Whitworth Fellow and Chartered Engineer. After two years working for the U.S. Navy in California, he moved back to the U.K. and was lecturer in Control Engineering in the Engineering Department at Cambridge University and a Fellow of Clare Hall, Cambridge, from 1970 to 1975. He was then appointed Professorial Fellow at the Australian National University (ANU) and helped set up the Centre for Resource and Environmental Studies (CRES). In 1981, he returned to the U.K. as Professor of Environmental Systems and Head of the Environmental Science Department, University of Lancaster. Since 1988, he has been the Director of the Centre for Research on Environmental Systems and Statistics at Lancaster. He was appointed Adjunct Professor in CRES at the ANU in 1997 and is now Emeritus Professorat Lancaster and Adjunct Professor in the Integrated Catchment Asessment and Management Centre at the ANU. He collaborates with research workers in several countries and is the author and editor of a number of books. He has published over 300 papers in the open literature. He is well known for his work on recursive estimation, forecasting and automatic control system design. His most recent research has been concerned with data-based mechanistic modelling, forecasting, signal processing and control for nonstationary and nonlinear (state-dependent parameter) stochastic systems. The applications of this methodological research are wide ranging, from the environment, through ecology and engineering to business and macro-economics.

F7

Contributed session: Forecasting exchange rates

Wednesday 11.30am-12.45pm Room:Bringas-P3

Chair: Michael P. Clements
University of Warwick, UK

Forecasting Foreign Exchange Volatility

J. Liu, E. Balaban, J. Ouenniche
Management School and Economics The University of Edinburgh

This paper primarily aims to evaluate the out-of-sample predictive ability of competing models for the volatility of foreign exchange changes. We compare the out-of-sample forecasting performance of monthly USD/GBP volatility using time series models for the period February 1973 to October 2005. We use both symmetric and asymmetric error statistics. Additionally, we employ a forecast efficiency test. The various model rankings are shown to be sensitive to the error statistics used to assess the accuracy of the forecasts. An overall evaluation shows that non-ARCH class models are superior to ARCH class models. However, ARCH class models take predominance overpredictions are more heavily penalised. We discuss the implications of our results for currency models including option pricing as well as policy making.

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General to Specific Modelling of Exchange Rate Volatility: A Forecast Evaluation

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L. Bauwens
CORE and Dept. of Economics Universite Catolique de Louvai

Most volatility models are highly non-linear and thus require complex optimisation algorithms in empirical application. For models with few parameters and few explanatory variables this may not pose unsurmountable problems. But as the number of parameters and explanatory variables increases the resources needed for reliable estimation and model validation multiply. Indeed, this may even become an obstacle to the application of certain econometric modelling strategies, as for example argued by McAleer (2005) regarding automated general-to-specific (GETS) modelling of financial volatility. GETS modelling is particularly suited for explanatory econometric modelling since it provides a systematic framework for statistical economic hypothesis-testing, model development and model (re-)evaluation, and the methodology is relatively popular among large scale econometric model developers and proprietors. However, since the initial model formulation typically entails many explanatory variables this poses challenges already at the outset for computationally complex models. In this study we overcome the computational challenges traditionally associated with the application of the GETS methodology in the modelling of financial volatility by modelling a measure of observed volatility (squared return) directly within a single equation exponential model of observable volatility (EMOV) framework with ordinary least squares (OLS) estimation. This enables us to apply GETS on a general specification with, in our case, a constant and twenty four regressors, including lags of log of volatility, an asymmetry term, a skewness term, seasonality variables, and economic covariates. Compared with models of the autoregressive conditional heteroscedasticity (ARCH) and stochastic volatility (SV) classes we estimate and simplify our specification effortlessly, and obtain a parsimonious encompassing specification with uncorrelated homoscedastic residuals and relatively stable parameters. Moreover, our out-of-sample forecast evaluation suggests that GETS specifications are especially valuable in conditional forecasting, since the specification that employs actual values on the uncertain information performs particularly well.

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Quantile Forecasts of Daily Exchange Rate Returns using Intraday Data

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Monasch University, Australia

Although quantile forecasts of returns are useful in risk management decisions, there is no empirical evidence on the importance of the use of intraday information to compute them. We compare two forecasting models to calculating quantile forecasts of daily exchange rate returns using the high-frequency intraday observations. Both models generate forecasts of daily realized volatility computed using intraday squared returns. The realized volatility is computed for five currencies against the US dollar (Australian dollar, Canadian dollar, Euro, Bristish Pound and Japonese Yen) from Jan 99 to Oct 2003. The first model uses intraday information on jumps and compound components in addition to daily autoregressive terms to predict the realized volatility (Heterogenous AR). The other one relates the estimated daily realized volatility to the intraday observations directly in order to obtain forecasts (Mixed Data Sampling). The quantile forecasts computed with the predicted volatility are evaluated using their empirical coverage and a tick loss function. Two forecast horizons are evaluated: next day and next week. Using fixed forecasting scheme, there is evidence of inaccuracy from both models for one of the currencies because of a break in the out-of-sample period. There is no difference in using intraday absolute returns instead of squared returns. Using a rolling scheme instead of a recursive scheme, both models generate quantile forecasts with better coverage. The quantile forecasts of the returns on the Euro have only correct coverage when the empirical distribution of the standardized returns is employed to compute quantile forecasts instead of assuming normality. This paper gives many contributions on how to use volatility forecasts and intraday information to get better quantile forecasts, but differences between the forecasting models are only found for specific currencies and forecasting schemes.

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O10

Contributed session: Count data

Wednesday 11.30am-12.45pm Room:Audiencia de la Reina-P4

Chair: John Boylan
Buckinghamshire Business School. UK

Forecasting Demand of Slow Moving Inventories: A Poisson State Space Approach

R. Snyder
Monash University

The demand for the typical slow moving inventory is over-dispersed in the sense that its variance is greater than its mean. An elaboration of the Poisson distribution will be presented in this session, which achieves over-dispersion by allowing the distribution mean to change randomly over time. Comparisons with other standard approaches to forecasting slow moving inventories will be made.

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Intermittence, bootstrapping and theory

J.E. Boylan, L.M. Smith
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Inventory rules for intermittent demand may require estimates of percentiles, especially in the upper tail of the distribution. Two approaches are used to estimate such percentiles: parametric and non-parametric. The parametric approach is based on distributions such as the Poisson or Negative Binomial, whereas the non-parametric approach is distribution-free. This latter feature is particularly attractive for highly 'lumpy' demand patterns, which show litle resemblance to any of the standard distributions. A team of American researchers has proposed a non-parametric bootstrapping approach to forecasting intermittent demand requirements, published in 2004. This approach works in two stages. In the first stage, the probabilities of demand occurrence are estimated, and used to generate demand occurrences for the bootstrap. In the second stage, non-zero demand values are re-sampled from previous observations. These are then 'jittered', by adding a normally distributed variable, to allow bootstrapped values to be generated that have not been previously observed. In this paper, three aspects of the bootstrapping procedure are examined from a theoretical perspective: i) the estimation of probabilities of demand occurrence, ii) the mean of the 'jittered' values, and iii) the upper tail of the 'jittered' distribution. An alternative approach to probability estimation is proposed, suitable if estimates are required only immediately after a demand occurrence. Also, an alternative to 'jittering' is examined, based on Discrete Quadratic Kernel estimation. The performance of the original method and modifications proposed in this paper are compared using simulations. Comparisons are undertaken across a range of upper tail percentiles, typical of those used in inventory applications.

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FM10

Contributed session: Methodologies

Wednesday 11.30am-12.45pm Room:Santo Mauro-P5

Chair: Hans. Levenbach
Delphus, Inc. Morristown, NJ USA

A conceptual representation of user interaction with a forecasting support system and its implications for design

S. Asimakopoulos, R. Fildes
Department of Management Science, Lancaster University Management School, UK

Alan Dix
Computing Department, Lancaster University, Bailrigg, Lancaster, UK,

The mainstream literature in forecasting views users as problem-solvers with forecast accuracy as their main goal when interacting with a forecasting support system (FSS). Users' interaction with the system is also viewed as a sequential and often rigid process that has clear costs and effort associated with it. Without underestimating the usefulness of this normative perspective, there is a lack of a systematic way to conceptualize user activities when interacting with a forecasting system. Observations and interviews with users indicate that the systems support the organizational forecasting procedure. Moreover, it presents them with opportunities to negotiate, manipulate, and interpret different statistical results. In this paper, we use hierarchical task analysis to describe the normative process of producing sales forecasts. In order to evaluate this against reported scenarios and observations of actual use, we apply an approach that uses a parallel to the grammar of everyday language to represent user activities. This approach presents some of the user activities that highlight (i) discrepancies between normative and actual use of forecasting systems (ii) user specific competencies that permit those activities (iii) and incidental activities that may offer viable possibilities for the design of FSS.

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What's important in life and what's important in research in forecasting: epistemological perspectives and research in sales forecasting.

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It is contended that the way in which we view the reality about us will influence the way in which we interpret the forecasting function / activity: and how we interpret the forecasting function will directly influence what we research in forecasting. In this light, various epistemological and theoretical perspectives are considered in relation to forecasting research. Much of the past research in sales forecasting seems to have been undertaken from a 'positivist' perspective. But, there seems that there is a lot to be gained by considering different theoretical perspectives. For example, the view that the sales forecast is a means of coming to a shared understanding of stakeholders (an epistemological stance of social constructionism) may consider forecast accuracy as of much lesser importance than the degree to which the process of forecasting leads to common undertakings. Similarly, the view that a forecast should be considered as a management control device a device to hold people accountable for their forecasts could be viewed from the theoretical framework of critical enquiry. Thus, changing one's view or the lens one uses will dramatically alter what one sees the forecasting activity to be and so will influence the nature of the research approach.

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Measuring Field Sales Forecast Accuracy in a Collaborative Environment

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Establishing performance metrics to evaluate forecasting accuracy of field sales people has always been a great challenge to management. With a current focus in demand forecasting organizations on collaborating with field sales forecasters and their clients for a "one-number" sales forecast, manufacturers and especially retail firms need an objective, fair and accurate scorecard to measure forecast accuracy in their sales force. This is being driven by the need to respond quickly to the requirements of a demand-driven supply chain. This presentation describes an implementation approach to create a scorecard reporting scheme for multiple product families in a segmented customer environment. The methodology is illustrated in a real-world example of a manufacturer of confectionary goods.

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O7

Invited session: Fiscal Forecasting

Wednesday 11.30am-12.45pm Room:Biblioteca-P7

Chair: Alfonso Novales
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How to monitor and forecast annual public deficit

D. Veredas, A. Silvestrini, L. Moulin, M. Salto
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This paper presents and evaluates a new approach to forecasting annual budget deficits using monthly data for an EU country. It aims at improving the accuracy of deficit forecasts, a relevant issue to policy makers in the Eurozone, and at proposing a replicable methodology exploiting public quantitative information on budgetary data. Using French data on central government revenues and expenditures, the method we propose consists of: 1) estimating monthly ARIMA models for all items of central government revenues and expenditures; 2) inferring the annual ARIMA models from the monthly models; 3) using the inferred annual ARIMA models to perform one-step-ahead forecasts for each item; 4) compounding the annual forecasts of all revenues and expenditures to obtain an annual budget deficit forecast. The major empirical benefit of this technique is that as soon as new monthly data becomes available, annual deficit forecasts are updated. This allows us to detect in advance possible slippages in central government finances. For years 2002, 2003 and 2004, forecasts obtained following the proposed approach are compared with a benchmarking method and with official predictions published by the French government. An evaluation of their relative performance is provided.

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A trend-cycle season filter

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The decomposition of macroeconomic time series to trend and cyclical components is crucial to forecasts in many areas. Economic concepts as, for instance, potential output or cyclically adjusted budget balances imply that short- and long-term components can be separated. Typically, the components are unobserved concepts which have to be identified on the basis of a theoretical model or plausible ad-hoc assumptions. Some approaches to the trend-cycle decomposition allow for estimating multivariate models, others are are purely mechanical transformations of the data. Complex methods--from a theoretical perspective often superior to the simpler ones--can be difficult to estimate, usually involving a relatively elaborate procedure of model selection. While simple filter methods are more convenient to use, the economic interpretation of their results may pose problems. An important problem, all approaches share, concerns the instability of trend estimations at the end of the data sample or within the projected period. This instability of trend estimations reflects shortcomings of the stochastic models implicitly or explicitly underlying these approaches in forecasting the true data-generating process. This paper follows an approach between the two polar approaches of trend extraction--models on the one hand and mechanical filters on the other. The proposed trend-cycle (TC) filter can be interpreted as an extension of the well known Hodrick-Prescott filter. Different from the HP filter, however, it is based on explicit stochastic models not only for the trend but for the cyclical component as well. Compared with other univariate filters, this improves the forecast properties and gives more plausible real time properties. Furthermore, the TC(S)-filter can be extended easily with a seasonal component. These properties make it a useful tool in projections of unobservables, as for instance, cyclically adjusted budget balances.

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A comparison of univariate methods for forecasting intra-annual public deficit

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European Central Bank

This paper focuses on the analysis of tools for the surveillance of budgetary positions. In particular, we compare the accuracy of some methods for short-term public deficit, revenue and expenditure forecastingfor the current year. In order to monitor the likely fulfilment of annual fiscal targets (such as those in Budget Laws or in European Stability and Growth Pact programmes) it is crucial to monitor promptly available intra-annual information. A traditional pragmatic approach consists in setting benchmark forecasts by using automatic univariate models. The methods considered in this paper include traditional ARIMA models, ARIMA models with heteroskedastic errors, unobserved components models, and an exponential smoothing method. The methods are compared using monthly public deficit series for the main euro area countries (Germany, France, Italy and Spain). We apply standard tests of quantitative and qualitative performance.

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TS7

Invited session: Seasonality II

Wednesday 11.30am-12.45pm Room:C-1

Chair: Thomas Evans
Bureau of Labor Statistics

Top-down, bottom-up and middle-out seasonal forecasting

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J. E. Boylan
Buckinghamshire Chilterns University College

Traditionally seasonality is estimated from the individual series. However, for a product family or a certain stock keeping unit (SKU) stored at different locations, estimating seasonality from the group may produce better estimates and improve forecasting accuracy. Previously, we have shown under what conditions seasonality estimated at the group level can result in better forecasting accuracy than seasonality obtained individually. This paper explores how subaggregate level forecasts can be improved by using grouping in a three-level system. Forecasts of the lowest level items can be obtained by direct forecasting from the items' history, top-down from the middle level (middle-out) and top-down from the highest level. This paper identifies the factors that affect the performances of these forecasting approaches. Simulations are conducted to validate the theoretical results and to examine the effect of alternative supply chain configurations.

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Seasonal Adjustment of CPS Time Series with Large Survey Errors

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The U.S. Bureau of Labor Statistics (BLS) directly seasonally adjusts 116 time series generated from the Current Population Survey (CPS). While the CPS produces highly reliable employment and unemployment estimates for national aggregates, many of the detailed demographic series are based on small samples. When substantial survey error (SE) exists in a CPS series, conventional methods of seasonal adjustment produce a trend, seasonal, and irregular decomposition that is very different from the classical decomposition. Much of the correlated survey error is absorbed into the trend, which produces spurious long run fluctuations. SE also tends to cause seasonal patterns to look less stable than they really are. We consider a signal-plus-noise model that combines a model of the population values and its unobserved components (trend, seasonal, and irregular) with a model of the survey errors. SE is treated as an additional unobserved component of the time series, with the special advantage that its variance-covariance structure is objectively identified by design information. We compare our results with those from X-12 and TRAMO-SEATS for selected detailed demographic series.

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Enhanced Graphics for Seasonal Adjustment Quality Analysis

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One of the major problems with any technique to perform seasonal adjustment is to easily analyze the results of large numbers of series, whether the procedure is model-assisted or model-based. Despite recent improvements in seasonal adjustment programs to "automatically" identify models, outliers, etc., there is no guarantee of an adequate model fit or seasonal adjustment. As many useful graphics and diagnostics are not available in standard seasonal adjustment packages, the analyst likely finds it inefficient, incomplete, and slow to scroll through numerous files containing charts or unsorted diagnostics. Some improvements have also recently been made in seasonal adjustment programs to consolidate ouput, but much improvement is needed. Many useful graphics and statistical tests can be added to standard output, such as plots of the component models, extended spectral plots, and outlier plots. In this paper, various statistical and graphical diagnostics are grouped in a single pdf file to allow for quicker analysis and to provide more compact documentation.

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EC13

Contributed session: Econometrics II

Wednesday 11.30am-12.45pm Room:C-2

Chair: Dulce Contreras
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Forecasting volatility using a continuous time model

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This paper evaluates and compares empirically the forecasting performance of a continuous time stochastic volatility model with two factors of volatility (SV2F) to a set of alternative models, such as: GARCH, FIGARCH, HYGARCH, FIEGARCH and Component Model (CModel). The empirical results show that two factors of volatility improve over one factor of volatility concerning volatility forecasting. We also observe that the performance of the models depends mainly on the characteristics of the out of sample period and on the forecasting horizon. Finally, as a proxy of ex-post volatility we use the realized volatility obtained from intra-daily data and the volatility forecasts of SV2F are calculated recurring to the reprojection technique proposed by Gallant and Tauchen (1998

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The relationship between ARIMA-GARCH and unobserved component models with GARCH disturbances

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The main purpose of this paper is to study the statistical properties of an unobserved component model with conditionally heteroscedastic noises, in comparison with ARIMA-GARCH processes. Focusing on the random walk plus noise model, we show that if either or both noises are GARCH, the reduced form of the model is still equivalent to an IMA(1,1) process. However, the reduced form disturbance is less heteroscedastic than the components. It is even possible to find particular cases where the reduced form disturbance could be seen to be homoscedastic. This result may have important implications for practitioners fitting ARIMA models with GARCH disturbances as the uncertainty reflected in the prediction intervals based on these models could be different from the underlying uncertainty associated with the components. The analytical results are illustrated by several Monte Carlo experiments where we generate series from heteroscedastic random walk plus noise processes. After fitting an ARIMA model with GARCH disturbances we show that in a large proportion of the series, the ARCH effects are not significant. The prediction consequences are analyzed empirically in real time series

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Testing the martingale difference hypothesis with multiple variance ratio tests

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In this paper, we analyze the behaviour of multiple variance ratio test against random walk models with uncorrelated but statistically dependent increments. We show that the size of the traditional tests is seriously distorted and they have low power when testing the null hypothesis of martingale rather than random walk. Moreover, we show that the new ranks and signs-based multiple variance ratio tests perform better in this context. The results of Yilmaz [J. of Buss. and Ec. Stat., 2003] are revisited by using the new procedures. We carry out an empirical assessment of the random walk hypothesis in daily exchange rates for several countries. Our results confirm the essential conclusion of Yilmaz (2003), that is, the differential behaviour of daily exchanges rates depending on different behaviour of Central Banks.

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F10

Contributed session: Finance III

Wednesday 11.30am-12.45pm Room:C-3

Chair: Albert DePrince
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Dynamic Liquidity Needs in Brazilian Financial Institutions

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Financial Institutions (FI's) keep liquidity resources as a form of assuring the normality of their operations, making front, without frights, to the demands for resources of depositors or of borrowers of credit. However, the determination of the appropriate volume of these resources is quite controversial. If, on one hand, a high amount of net assets reduces the probability for FI to face liquidity problems, on other, it causes a negative impact on its profitability, once that such net assets are paid taxes inferior to the ones on longer periods. Similarly, the maintenance of reduced liquidity resources exposes the FI to a higher risk: the probability of don't having sufficient resources for the maintenance of the normality of its operations. On this context, the present article intends to purpose a determination method for minimum liquidity levels in Financial Institutions to contemplate this problem. For such, the work is structured in the following way: initially, a review on how literature is treating the theme is accomplished, with prominence for the method of Dynamic Liquidity Needs. On sequence, a determination method of the minimum liquidity levels is proposed in financial institutions, starting from a sequential process of separation of the stable assets from the volatile ones - through endogenous methods of separation of non-observed components in time series, followed for the counting of the concentration levels of the credit operations and of the deposits - through Index of Gini - and joining other elements that affect the volatile assets. Finally, the model is tested in a sample of financial institutions of the Brazilian market, which results indicate that the proposed method is effective to identify, to absorb and to treat the characteristics of each institution to determine the minimum liquidity levels demanded, so that, there is safety in the financial administration.

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Forecasting Net Interest Margins by Bank Asset Class Using Panel Data

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The Interstate Banking and Branch Efficiency Act (1994) permitted interstate branching by July 1997 and accelerated a consolidation underway since 1982. Banks of mammoth size appeared, while the number of small banks imploded. Given the industry's structural change, it is possible that the profitability from financial intermediation also shifted. Net interest margin (net interest income to average assets) or NIM is used as the relevant profit measure for intermediation. To focus on effect of asset size on profitability, all banks are assigned to one of five asset classes for each year of the 1992-2005 sample period, ranges for each class change from year to year to reflect inflation, and average NIM is calculated for each asset class for each year. This study first evaluates differences in NIM by asset class over the sample period. Next, a longitudinal model is developed using panel data, where the bank asset classes serve as the panel and as the cross-sectional variables. Explanatory variables include various interest rates and economic variables, as well as the relative mix of assets, the relative mix of liabilities, the relative mix of credit quality, and the relative mix of the maturity structure of asset and liabilities by asset class. Preliminary results suggest that interest rates effects differ by asset classes, economic variables had common effects across assets class, and fixed effects played a very important role. Variables that have unique effects for each asset class, but not yet included in the model may have been captured by the fixed effects coefficients. The investigation goes on to include the relative mix of assets, liabilities, credit quality and maturity structure by asset class as cross-sectional variables. Once the relative variables are identified, the complete model will be used for one-period ahead forecasts.

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