ABSTRACTS

Plenary Session: Keynote Speech

Monday, 27 June, 8:00am-9:20am   Room: RB101

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

Macroeconomic Forecasts: Betraying Us When Most Needed

Jan Fischer

European Bank, for Reconstruction and Development, United Kingdom

Based on empirical data produced in time the crisis was almost knocking at the door the presentation shows how tricky and unreliable macroeconomic forecasts when a turning point (low, high) comes up. That means in time when forecasts are most needed. On the other hand long-term forecasting (e.g. energy generation, production, and demand) suffers not only with instability and unpredicatability of parameters but also the so called 'Black Swan Effects' can cause a bitter and frustrating gap between forecasts and reality. The second part of the presentation brings data on forecast of the short- term economic development in EBRD's countries of operation and its interpretation.

Jan Fischer joined the European Bank on 1 September 2010 as Vice President, Operational Policies. Reporting to the President, the Vice President, Operational Policies has overall responsibility for the development and delivery of the Bank's policies on Environment and Sustainability; Procurement and Consultancy Services; Stakeholder Relations, including the Bank's Gender Action Initiative. Prior to joining the EBRD, Mr Fischer was the Prime Minister of the Czech Republic, from 9 April 2009 to June 2010. From April 2003 to April 2009, he was the President of the Czech Statistical Office. Mr Fischer is a member of a number of prestigious institutions, including the Czech Statistics Society, the International Statistics Institute, the Science Council, the Board of Trustees of the University of Economics, Prague, as well as the Science Council of the University of J.E. Purkyně in Ústí nad Labem.

Featured Session

Monday, 27 June, 9:30am-10:30am   Room: RB210

Chair: Stephan Kolassa, SAF AG, Germany

Forecasting for Operations
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Traditional measures of forecast accuracy, such as the mean absolute percentage error, are irrelevant in operational decision-making. Managers are concerned instead with the impact of forecasting on operational performance measures: cost, investment, customer service, and efficiency. I will use case studies from my consulting experience to demonstrate how forecasting drives these performance measures. The cases are drawn from manufacturing and physical distribution applications in chemicals, snack foods, water treatment systems, and cookware. In each case, I show that the choice of forecasting method makes a significant difference in operational performance. In manufacturing, better forecasting reduces costs and improves productivity and scheduling efficiency. In distribution, better forecasting reduces the inventory investment needed to meet a customer service target.

Everette S. Gardner, Jr. is Professor in the Bauer College of Business and Fellow of the Honors College at the University of Houston. He served 20 years in the U.S. Navy and retired with the rank of Commander. He is a Vietnam veteran and served in USS James C. Owens (DD-776) and USS Dwight D. Eisenhower (CVN-69). Dr. Gardner received the Ph.D. in Business Administration from the University of North Carolina at Chapel Hill. He has authored or co-authored four books, including Quantitative Approaches to Management (8th edition) from McGraw-Hill. Among his many publications in forecasting are two seminal papers on the state of the art in exponential smoothing, published in the Journal of Forecasting (1985) and the International Journal of Forecasting (2006). His 1985 paper was ranked by a panel of experts as the third most influential paper published in forecasting during the last 25 years. In 2007, Dr. Gardner was elected Fellow of the International Institute of Forecasters.

Featured Session

Monday, 27 June, 9:30am-10:30am   Room: RB212

Chair: Kajal Lahiri, University at Albany, USA

Optimal Forecasts in the Presence of Structural Breaks

M. Hashem Pesaran

University of Cambridge, UK, University of Southern California, USA

The paper considers alternative approaches to taking account of structural breaks in forecasting, and derives weights for observations in weighted least square regressions that lead to optimal forecasts in the presence of breaks. Analytical expressions are provided in the case of a single regressor. For more complicated models asympotically valid weights are provided as well as exact weights that can be computed numerically. In the case of a single break it is shown that the value of the optimal weight is the same across observations within a given regime and differs only across the regimes. The analysis is also generalized to the case of multiple breaks. The main interest lies in breaks of the intercept and of slope parameters but breaks to the error variance are also considered. The forecasts based on optimal weights are shown to be superior to forecasts from post-break estimation windows, optimal estimation windows, averaging across estimation windows and exponential smoothing. In practice where information on structural breaks is uncertain a robust optimal weight forecasting procedure is proposed, and a number of empirical applications are provided.

Dr M Hashem Pesaran was born in Shiraz, Iran. He got his school diploma from Nemazi School in Shiraz and left for England for further studies on a scholarship from Bank Markazi Iran in November 1964. He received his BSc (First Class Honours) in Economics, Mathematic and Statistics at the University of Salford (England) and his PhD in Economics at Cambridge University. Currently, Dr Pesaran is a Professor of Economics at Cambridge University (http://www.econ.cam.ac.uk/faculty/pesaran/) and a Fellow of Trinity College, Cambridge. He is also the John Elliott Chair of Economics at the University of Southern California. Previously, he was head of the Economic Research Department of the Central Bank of Iran (1974-76) and the Under-Secretary of the Ministry of Education (1976-78), Iran. He has also been a Professor of Economics and the Director of the Applied Econometrics Program at UCLA (1989-93), and a Visiting Professor at the Institute of Advanced Studies in Vienna, the University of Pennsylvania, and the University of Southern California, where he served as the Director of USC College Institute for Economic Policy Research over the period October 2004 to April 2006.

TSA1

Contributed Session: Time Series Analysis

Monday 27 June 9:30-10:30am   Room: RB205

Chair: Christos Emmanouilides

Gaussian process forecasting of mood in bipolar disorder

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Bipolar disorder is characterised by recurrent episodes of mania and depression and affects about 1% of the population. Mood forecasting can facilitate the recognition of relapse and can provide objective information about the patient's clinical status. In this paper we forecast mood ratings in patients with bipolar disorder using exponential smoothing and Gausssian process models. Self-rated mood data is used, comprising weekly scores for depression on a standard scale. To evaluate the forecasting methods, a fixed-length window is moved through each time series and used to forecast the next week's mood rating. A baseline method is applied by using the last value in the training window as the forecast. Forecasting performance for an individual patient is summarised by the root mean square error over the next step forecasts for their time series, and the distribution of these errors over the group of patients is examined. We find that Gaussian process forecasting is slightly more accurate than simple exponential smoothing in this application. Further work is proposed on variable selection, including the incorporation of environmental predictors, and on mood event forecasting. We conclude that the recent availability of data and the paucity of published models both make for potentially important advances in the field.

Online Short-Term Forecast of System Heat Load in District Heating Networks

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This paper presents an online short term forecasting approach for system heat load in district heating networks using the popular Seasonal Autoregressive Integrated Moving Average (SARIMA) models in state space representation.

The system heat load itself is a non-stationary random process composed of the individual consumer heat demands plus heat losses from pipes. Short term load forecasting is essential for effective operational production planning. It was found that the recurring pattern of the process based on half-hourly data are well described by a SARIMA (2,1,1)(0,1,1)48 model. The adequacy of the model was confirmed by standard regression diagnostics. Furthermore, the identified SARIMA model was incorporated into the state space framework where classical Kalman Recursion allows convenient calculation of on-line forecasting values. Moreover, exogenous effects such as weather effects are explicitly accounted for by decomposition of the original time series into an outdoor temperature dependent part and a social component part, where the latter was again modeled as SARIMA process. The relationship between system heat load and outdoor temperature may appropriately be expressed by a piece-wise linear function. Finally, the performance of the proposed model is validated on real data by calculating the mean absolute percentage error (MAPE) value for 48-steps-ahead (24h) estimates. The on-line performance for the basic and the temperature adapted model was assessed by computing rolling 24-steps ahead MAPE values for approx. 20 days of real data. In this work, the Kalman procedure is presented as an elegant approach for prediction of SARIMA processes in state space representation. Specifically, it is shown that the proposed methods are suitable for on-line short term forecasting of system heat load in district heating networks.

Improving early diffusion forecasts with data imputation and smoothing

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Innovation diffusion data are usually available as annual observations of penetration level or number of adopters. Forecasting the diffusion path of new products at early stages is a difficult task due to the inherent uncertainty about the data generating process (DGP); Short annual data series make estimation of the diffusion DGP unreliable. To tackle this problem we propose a data imputation approach that uses only information contained in each series, in order to increase the number of observations available for estimation in a given time window. Annual diffusion series are imputed using data smoothing techniques that capture trends present in the data. Then, several established diffusion models are estimated in the early part of the series. The short, medium and long range (1, 3, 5, and 10 years ahead) forecasting performance of these models, together with the performance of data smoothing models, is analyzed using MAPE and MdAPE as accuracy measures. It turns out that diffusion models' forecasts are on average more accurate when the estimation window includes the imputed data. This is more prevalent for longer term forecasts. The second finding is that data smoothing models tend to produce more accurate early diffusion forecasts than established diffusion models, despite their theoretical implausibility and empirical shortcomings (e.g. lack of an asymptote for the market potential).

FUZ1

Contributed Session: Fuzzy forecasting

Monday 27 June 9:30-10:30am   Room: RB207

Chair: Okan Duru

Fuzzy Logic as a Support for Long-term Investment Decisions

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This paper discusses possible use of fuzzy logic as a decision making support for long-term investment decisions on financial markets. A simple model based on fuzzy logic is designed in order to analyse the current situation on the market and to find interdependencies between the model\'s input variables. The input of the model presented in this paper consists of several variables that describe the market conditions. The purpose of the model is to analyse the market situation described by the input variables and provide investment recommendations for long-term investments.

A fuzzy logic based approach to leakage forecasting in water industry

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Leakage and demand forecasting is a crucial part of the resource planning decision making in the UK water industry. OFWAT - the economic regulatory body - sets the annual leakage targets for 5 years in advance. However, the leakage is not constant throughout the year and depends on the leakage control policy applied, external factors and seasonal fluctuations. The leakage for each month of the year is forecasted and later adjusted every quarter as new data become available. In this paper, a new system is developed to help the expert in adjusting the leakage forecast based on the newly available data, as well as other factors used for leakage forecasting, such as Natural Rate of Rise (relates to the rate at which the leakage increases over time), efficiency measures (hours to detect the leakage) and the number of reported and detected leakages. Fuzzy clustering and a fuzzy interpolation method are applied to generate fuzzy if-then rules based on the recorded data. The fuzzy rules represent imprecise knowledge of the

relationship between the above mentioned factors and leakages. The leakage forecast is then adjusted using the generated fuzzy rules. The proposed approach is verified using real-life data from one of the leading water supply companies in the UK.

Is Fuzzy Time Series a fallacy? Potentials and limitations of fuzzy set approach in time series analysis

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The aim of this paper is to investigate the validity of fuzzy extended time series analysis and its limitations. In computer aided forecasting approach, fuzzy time series is one of the most cited methods. Fuzzy set theory is developed for dealing with systems under uncertainty and fuzzy time series (FTS) particularly improving time series analysis by data clustering and rule-based forecasting framework. On the other hand, FTS does not replace the conventional econometric approach for theoretical analysis and hypothesis testing. Moreover, the multivariate models of FTS may indicate a kind of deception unless the theoretical context is confirmed. In FTS literature, many authors present accuracy control for in-sample estimation rather than post-sample performance. This paper reviews drawbacks of FTS and also presents its potential for unsupervised forecasting systems.

CLI1

Invited session: Global Warming

Monday June 27 09:30-10.30   Room: RB213

Chair: Kesten Green

Atmospheric carbon dioxide: What we do and don't know about its effects

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The most important physical quantity that quantifies the influence of CO2 on the climate is the climate sensitivity. The speaker will present several methods to estimate its value; all methods turn out to be compatible with a value close to 1° Celsius, i.e. a small fraction of the IPCC figure. The methods include a calculation from the first principles, divided to the no-feedback contribution and the feedbacks; historical estimates of the feedback amplification based on the stability; regression analysis of the historical data at several time scales; and short-time analyses of the responses of energy fluxes, humidity, and heat in the ocean to temperature variations. More general effects of higher CO2 concentrations on the world's ecosystems and the economy will also be discussed; they turn out to be predominantly beneficial.

Predicting the persuasiveness of alarming forecasts: The case of dangerous manmade global warming

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We assessed the persuasion techniques used to convince the public to believe alarming forecasts of dangerous manmade global warming against evidence-based persuasion principles. We did the same for efforts to convince the public that there is no reason for alarm. The news media are of course motivated to give more coverage to alarming forecasts as they represent "news." The alarmists have used strategies that are appropriate for low-involvement issues: repetition, examples, reason-why, stories, one-sided arguments, emotional appeals (fear and guilt), social proof, authority, and innuendoes. However, given the enormous economic and social upheaval advocated by alarmists, the issue has become high-involvement. As a result, evidence-based advertising principles lead us to predict that the alarmists' strategies will lose effectiveness. We discuss persuasion strategies that might be used by each side and make predictions about the likely outcomes of each strategy. In particular, beliefs in alarming

forecasts of manmade global warming are likely to become less common if skeptical authority figures repeat in a calm indirect manner rational two-sided arguments that are supported by

easily verified facts. Skeptics should also continue to challenge incorrect claims by alarmists. These approaches are not open to the alarmists. Thus, we predict that belief in the alarming forecasts will continue to lose ground, even though alarmists will continue to greatly outspend the skeptics in their efforts to persuade the public and decision makers. We cannot predict when alarmist beliefs will cease to hold sway.

Long-range forecasting of the global warming alarm phenomenon: Predictions from structured analogies

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Climate and Environment Alarming forecasts of manmade global warming have led to the implementation of costly public policies and call for the implementation of even more costly policies around the world. When we found that the forecasts were not the product of good knowledge of climate processes or of proper forecasting procedures, we were concerned to know what would become of the global warming alarm phenomenon. We obtained forecasts using the structured analogies method, which involves identifying situations from the past that are similar to the target situation and using their outcomes to predict the outcomes of the target. To our surprise, we found many (26) alarms based on forecasts of material human catastrophe arising from effects of human activity on the physical environment, that were endorsed by experts, politicians and the media, and that were accompanied by calls for strong action. The analogies lead us to predict that harmful policies will persist, even after the current alarm has faded from public attention.

MKT1

Contributed Session: Marketing

Monday 27 June 11:00am-12:30pm   Room: RB203

Chair: Samantha Buxton

Observation and Analysis of the Semiconductor Cycle with a State Space Model

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Cyclical behavior in semiconductor market has been well-known as so-called Silicon Cycle. However, the quantitative understanding of dynamics has not been studied enough and the unpredictable market behavior remains an industrial issue to be understood in semiconductor industry. In these days, the market data has been accumulated for over the past twenty years and we are finally in a possible stage to pursue the quantitative analysis for the cyclical behavior by time series analysis. In this study, we constructed a structural time series model for semiconductor market and analyzed the market behaviors. This first approach successfully reproduced the cyclical behaviors, which are consistent with the observation in the market. Further, the behaviors were well supported by considerations resulting from principal component analysis for semiconductor market.

Asymmetric price response and its causes

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Price of a final product reflects the changes of the input material price. But it is widely known that cost increase and decrease are reflected to price in quite different ways. As typical example, retail gasoline prices respond faster to crude oil price increases than to crude oil price decreases. This phenomenon is called 'price stickiness' or 'price rigidity', and is described as 'asymmetric price response.' The number of empirical researches on price stickiness was rather limited. But in recent years, the soaring price of the retail gasoline has brought a popularity to inquire the magnitude of asymmetry and how much it costs to consumers' wealth. This phenomenon is explained by several theoretical hypotheses like existence of a menu-cost, bounded rationality (inattention to price changes), and strategic interactions between a firm and its customers (fair pricing). In this study, we use a time-series approach to analyze the size of asymmetric response. And then we empirically test which hypothesis is the most consistent with the pattern of sticky price found in US gasoline price data. Tests are implemented by using vector error correction model and binary choice models.

New product sales forecasting model: a consumer textile products application

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Producing reliable forecasts for new products is very challenging but crucial for businesses that are required to stock, if not produce, enough quantities to cover unobserved demand. The problem is aggravated if a product has relatively long production or order lead time, making it impossible for a company to react to unexpectedly high demand by placing additional orders. The lack of historical data has made companies to rely heavily on judgemental forecasts, until enough sales have been observed, when they can switch to statistical methods. Limited research has been done in providing baseline statistical forecasts for new products and consequently identify adequate safety stock levels. In this study we examine the case of a company that trades consumer textile products. These products exhibit very strong differences between the first weeks of sales and normal sales, mainly due to the initial shelve-filling orders by retailers. We propose a statistical framework to produce forecasts for new products based on time series clustering and analogies, using only the product type and the initial launch orders that are known before trading is commenced. The algorithm identifies past product launch profiles based on historical data, constructs archetypal behaviours and uses them to produce forecasts for the new products. Furthermore, our method provides safety stock calculations, based on desirable service levels. We use real data from a UK textile company to empirically evaluate the proposed framework against demand estimates produced by experts in the company and benchmark statistic models, such as the naive. Based on results across 30 different product launches, including multiple product categories, the proposed method not only results in reduced forecasting errors but also drastically cuts stock-outs.

Modelling and Forecasting Pharmaceutical Lifecycles

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We examine the pharmaceutical sales in the context of lifecycle modelling and forecasting using time series analysis. This is accomplished by comparing the lifecycles of 1000 pharmaceutical drugs using an algorithm that determines the most common lifecycles of pharmaceutical drugs. The data regarding these drugs comes from a database known as Jigsaw that contains data associated with 2.57 million scripts written by General Practitioner's (GP's). Our research aims to produce these graphs for individual drugs using the number of sales that occurs, while also comparing the lifecycles for each drug in sixteen Regional Health Association's (RHA's). The second phase of the study focuses on forecasting the final section of the pharmaceutical drugs' lifecycles using a number of state of the art methods to determine which accurately fits the data.

Contributed Session: Strategic forecasting

Monday 27 June 11:00am-12:30pm   Room: RB204

Chair: Ahmad Al Shami

ICT and ICT specialists - two important aspects of economy growth in the context of university education

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Turbulent economic environment after overwhelming the crisis period is typical for present days as well as permanent increasing dependability of all our activities on information and communication technology (ICT). Although the global economic crisis was the reason for disinvestment into ICT in 2009 there is expected that ICT will generate almost 5.8 million new jobs till year 2013 and they have to be have to be saturated also by adequately qualified ICT specialists. This contribution presents the research in progress focused on impacts of the ICT sector and its contributions to economy and compares actually starting positions of the Czech Republic and European countries from the point of view of number of university graduates (with partially accent on ICT education) as driving potential in the economy. General base for using ICT in economy and their impact on economy is sufficient number of well qualified specialists with university education background especially ICT professionals. There are presented other aspects and features of today's economy, which is at present time in stagnation period all over the world. Some influence factors and their evolution in this pre-crisis period on ICT (information and communication technology) are presented in this contribution with a special accent on macroeconomic indicators in the Czech. Data series of ICT macroeconomic indicators in the Czech Republic are set into relation to other European countries. Some recommendations, proposals and forecasts for further development of education system and economic growth based on ICT in the Czech Republic are presented at the end of this contribution.

Forecasting crime in Germany

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Like most industrialized western countries Germany will be exposed to a demographic change within the next decades. Until the year 2030 the age composition in Germany will dramatically change, as there will be more old and less young people. These developments influence all parts of society, however, the institutions of formal social control will be affected in particular: older people commit less crime than younger people. The aim of this paper is to present a model that forecasts regional crime rates for the German state of Bavaria. This allows us to explore the county-specific impact of demographic change. In a first step relevant factors that influence crime rates are identified. On the one hand sociological and economic theories of crime are used to determine relevant factors. On the other hand expert opinions of a set of interviews with executives of the law enforcement agencies (e.g. police officers, judges, attorneys) are included. The interviews were conducted between February and June 2010 in the context of our project on the impact of demographic change. After having identified the set of potentially relevant factors, multivariate panel models with county-level crime data are estimated for different types of crime. In a second step these models are used as the base for forecasting future crime rates. Before obtaining forecasts, however, one must estimate values of the independent variables, e.g. a country's economic development. This data is not provided on a disaggregated regional base for all variables so that forecasts are based on either extrapolation or explicit scenario assumptions.

Predicting Innovative Capacity of European Regions: The Role of Diversity and Tolerance

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During the past decade diversity has become increasingly a crucial factor for the innovative capacity of companies and sites. Not least according to Richard Florida's study The Rise of the Creative Class soft factors such as tolerance have also drawn broad attention within the discussion of economic performance and the future viability of sites and regions. The scope of this paper is first an analysis over time (2001-2009) concerning the influence of diversity (i.e. regionalized levels of non-national workforce by region, data source: EU Labour Force Surveys) and tolerance (i.e. individual-level indicators of social distance, data source: regionalized European Social Survey supplemented by data from European Value Surveys and Eurobarometer) on the innovative capacity of European regions (NUTS-2 regions of most of the EU-27 countries, data were derived from the European Innovation Scoreboard). For this purpose, the empirical adequacy will be tested by means of multilevel regression modeling, whereas the variable tolerance is taken to mean a context factor influencing the relationship of diversity and innovative capacity. Besides the understanding of tolerance as an opportunity structure indicating open-mindedness and social recognition, levels of tolerance can also be considered as indicators of national immigration policies or the progress of social integration of immigrants. In a second step, based on the results of the analysis, a forecasting model will be developed integrating the factors described above. For this purpose, temporal relations (time lags) between the variables with reference to the regional units are estimated by means of correlation studies. The aim here is to develop an indicator relation between the determinants diversity and tolerance with innovative capacity, which enables showing future trends concerning innovation and future viability of those sites. Thus, this paper also contributes to link social science issues and forecasting methods.

Forecasting Macro-Knowledge Competitiveness; Integrating Panel Data Analysis and Computational Intel

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The aim of this paper is to propose an active framework for forecasting the competitiveness of knowledge based economy (KBE) for nations to serve the public, private, foreign and policy makers. We have used three different forecasting methods including, panel data analysis, artificial neural networks (ANN) and regression analysis. By structuring and feeding balanced, normalized panel data to the ANN framework, we were able to produce a better predicted results compared with the panel data fixed effect model and the multiple regression. The ANN framework can be applied in the context of forecasting the competitiveness of a KBE for any nation regardless of small time periods, or little data. To achieve this forecasting model, a three steps framework is proposed. The first step was to structure the data as panels, the second step is to cluster the data using Self Organizing Map (SOM), and the third step employed training a four layers feed-forward artificial neural network system. The purpose of the first step was to exploit both the cross sectional and the time series variations on the same economy. The SOM is employed to determine the relationship between the different indicators employed, to cluster, and to generate a map of the competitiveness variables that affects a knowledge based economy among the existing indices. Finally the ANN was used to create the trained framework which was capable of predicting the knowledge competitiveness and progress in any economy.

NN1

Contributed Session: Neural Nets

Monday 27 June 11:00am-12:30pm   Room: RB205

Chair: Nikos Kourentzes

Outliers and anomalies detection based on neural networks forecast procedures

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The paper deals with the detection of outliers and anomalies in time series. This issue has a great influence on the accuracy and stability of data handling procedures. The difference between terms of outliers and anomalies according to behavior of the system is defined. The outliers and anomalies detection procedure is proposed and it contains 5 steps. The first step is to predict the next point in time series based on a forecasting model. Forecasting models are based on constructive neural networks approaches. The absolute error and statistical characteristics are calculated at the second step. The third step contains the procedure for the threshold calculation based on the previous results and statistics characteristics. This threshold defines the interval for detection of normal values. Next step includes checking - if the measured value is into interval it means we can consider it as a correct value. Otherwise this value is marked as an outlier and it can be replaced by the predicted value. The last step contains the procedure based on cluster neural networks approaches to identify clusters in the time series. If a new cluster is detected and this cluster contains uninterrupted sequence of outliers this behavior is marked as an anomaly. The implementation of this procedure is explained and conclusions for outliers and anomalies in energy consumption time series data are reported.

A review and comparison of strategies for multi-step ahead time series forecasting using Lazy Learning

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In the forecasting community, researchers have paid attention to several aspects of the forecasting procedure such as model selection, effect of deseasonalization, forecasts combination and many other critical topics. However, approaches for generating multi-step ahead forecasts for machine learning models did not receive as much attention, as pointed out by Kline in his work on methods for multi-step time series forecasting with neural networks. Several approaches that deal with this complex problem have been proposed in the literature such as Recursive, Direct, DirRec, Joint and DIRMO. In the literature, these five forecasting strategies have been presented separately, sometimes, using different terminologies. To fill this gap, this work presents a thorough unified review as well as a comparative analysis of the existing strategies for multi-step ahead forecasting. Moreover, despite the fact that many studies have compared between these multi-step ahead approaches, the collective outcome of these studies regarding forecasting performance has been inconclusive since an extensive comparison of all the strategies on a large number of tasks is still missing. So the modeler is still left with little guidance as to which strategy to use. This work aims to fill this gap by reviewing existing strategies for multi-step ahead forecasting and comparing them in theoretical and practical terms. To attain such an objective, we performed a large scale comparison of these different strategies using a large experimental benchmark (namely the 111 series from the NN5 forecasting competition). In addition, we considered the effects of deseasonalization, input variable selection and forecast combination on these strategies and on multi-step ahead forecasting at large. The following three findings appear to be consistently supported by the experimental results: Multiple-Output strategies are the best performing approaches, deseasonalization leads to uniformly improved forecast accuracy, and input selection is more effective when performed in conjunction with deseasonalization.

Prediction of Temperature Daily Profile by Stochastic Update of Backpropagation through Time

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We will examine prediction of temperature daily profile using various modifications of backpropagation through time algorithm (BPTT) done by stochastic update in the artificial recurrent neural networks (ARCNN). The general introduction was provided by Salvetti and Wilamowski in 1994 in order to improve probability of convergence and speed of convergence. This update method has also one another quality, its implementation is simple for arbitrary network topology. In stochastic update scenario, constant number of weights/neurons is randomly selected and updated. This is in contrast to classical ordered update, where always all weights/neurons are updated. Stochastic update is suitable to replace classical ordered update without any penalty on implementation complexity and with good chance without penalty on quality of convergence. We have provided first experiments with stochastic modification on backpropagation algorithm (BP) used for artificial feed-forward neural network (AFFNN) in detail described in the article 'Stochastic Weight Update in The Backpropagation Algorithm on Feed-Forward Neural Networks' presented on the conference 'International Joint Conference (IJCNN) 2010' in Barcelona. The BPTT on ARCNN uses the history of previous steps stored inside of the ANN that can be use for prediction. We will describe exact implementation on the ARCNN, and present experiment results on temperature prediction with recurrent neural network topology. The dataset used for temperature prediction consist of the measured temperature from the year 2000 till the end of February 2011. Dataset is split into two groups. Training dataset, which is provided to network in learning phase, and testing dataset, which is unknown part of dataset to ANN and is used to test the ability of ANN to predict the temperature and the ability of ANN to generalize the model hidden in the temperature profile.

Using adaptive weighted information criterion in forecasting with neural networks

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In recent years, one of the most preferred methods for time series forecasting has been artificial neural networks (ANN) because of its easy implementation and high accurate performance. In the literature, there have been many studies in which various time series from different fields are successfully forecasted by using ANN. However, there are still some problems with using this method. One of these is to determine the best ANN architecture which gives the best forecasts. In the literature, various performance measures such as root mean square error (RMSE) and mean absolute percentage error (MAPE) have been employed to find the best architecture. Egrioglu et al. (2008) proposed a model selection criterion which is called weighted information criterion (WIC). WIC consists of summing weighted values of performance criteria such as RMSE, MAPE, Bayesian information criterion, Akaike information criterion, direction accuracy, and modified direction accuracy. Egrioglu et al. (2008) showed that WIC is more consistent than the other criteria. Then, Aladag et al. (2010) proposed a new performance measure which is called as adaptive weighted information criterion (AWIC) by improving WIC by using optimization to determine the weight values. Aladag et al. (2010) showed that AWIC is more consistent than WIC. In this study, SKF monthly Turkey

sales for product X time series is forecasted by using feed forward ANN and AWIC is used to determine the best architecture. As a result of the implementation, obtained results are compared to results obtained from other criteria available in the literature.

Invited session: Forecasting With Large, Structured Datasets

Monday 27 June 11.00-12.30   Room: RB206

Chair: Hans Levenbach

Demand Forecasting – More demanding than statistical forecasting?

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Demand management has become more and more complex as large datasets have become commonplace to the process of integrating all necessary tasks to develop a consistent demand forecast for all products at all locations for an enterprise. This can be a daunting task given today's competitive environment and the various life cycle profiles of a company's product offerings. The number of forecasts that an enterprise requires on a weekly to maintain appropriate levels of inventory can exceed 500,000. Wal-Mart, BestBuy, Staples and RadioShack all have a large number of products being sold at a number of locations. Each product/location requires a forecast; usually a weekly forecast but almost always a monthly forecast. In addition, forecasts may also be required for aggregations of product/locations; e.g. family, style color, group, retail location, distribution center, district, region, etc. The challenge is how to manage a process that requires in excess of 500,000 weekly forecasts at an accuracy level necessary to attain specific customer service levels within inventory investment parameters. Obviously, statistical forecasts play a major role in generating such a large number of forecasts. The market is abundant with statistical techniques that promise improves accuracy and speed of computation. Yet, how does one determine when (a)The statistical forecast in not performing, (b) To override the statistical forecast with judgment (c) To apply rule based forecasts (d) To switch statistical methods. A forecast analyst, or even a department of forecast analysts, cannot effectively review upwards of 500,000 forecasts on a weekly or even a monthly basis. How does one manage such a process and maintain an acceptable accuracy level?

Improved Forecasting Tools for Large Datasets Point the Way to Lower Inventories

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More and more companies are discovering that good forecasting can lead to lower inventories and enhanced customer service. Over the years, these companies take a more granular approach to forecasting demand than using a traditional spreadsheet or flat file paradigm. This allows them to forecast hundreds of SKUs (stock keeping unit) as well as by hundreds of customer segments, such as stores, customer accounts, plants and distribution centers. Supply chains have become more geographically dispersed, as well, leading to new challenges in maintaining high customer service levels while achieving profit margin goals. As a result, the need for robust forecasting practices and efficient database-oriented forecast support systems have given forecasters added reasons to get additional training, sharpen

their tools, and become more pro-actively involved in inventory and demand planning issues. In this talk we will describe why a data-driven forecasting process guides demand planners to become key contributors to improved inventory practices.

Truck optimization based on demand forecasts

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(Good) forecasts of future demands are a crucial ingredient for operational control of the supply chain - but only one among others. We present the new truck optimization functionality of SAF SuperWarehouse, which optimizes the number and utilization of trucks carrying product from CPG suppliers to retail distribution centers based on demand forecasts. In particular, we address available data, constraints, algorithms, quality measures and target functions and describe the difficulties encountered in practical optimization.

An Introduction to Time Series Segmentation Analysis Using SAS®

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Web sites and transactional databases collect large amounts of time-stamped data related to an organization's suppliers and/or customers over time. Extracting major features of these time-stamped data can help business leaders make better decisions by enabling them to listen to their suppliers or customers via their transactions collected over time. This paper proposes techniques for large-scale time series segmentation analysis. Extracting major features from time series is useful for decomposing time series (major and minor series), customizing the time intervals for time series with high and low activity time periods, time series data mining (searching and clustering), turning point analysis, visualizing long time series, and other activities. This paper demonstrates these techniques using SAS ® software.

Contributed Session: Exponential Smoothing

Monday 27 June 11:00am-12:30pm   Room: RB210

Chair: Anne Koehler

Automatic model selection of Exponential Smoothing Methods - an empirical evaluation for forecasting

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The topic of model selection is of particular importance for time series prediction in logistics and supply chain management, where companies must forecast a large number of time series with heterogeneous patterns. Despite the empirical significance of the problem, and the narrow class of exponential smoothing models to choose from, research remains inconclusive on how to best conduct model selection automatically (Gardner, 2006). In selecting methods individually per time series, conflicting best practices exist: statistical research suggest selecting between exponential smoothing methods by employing a grid-search of suitable models and choosing the one with the optimum Information criteria (e.g. AIC, see Hyndman, 2006, and the R-toolbox) or lowest error measure (e.g. SAP APO-DP), normally employing 1-step ahead in-sample metrics. In contrast, expert systems (e.g. ForecastPro) show preeminent results by rolling out-of-sample evaluation on multiple step-ahead horizons of different length. Considering the undisputed conclusion of the M-competitions that in-sample errors do not reflect out-of-sample performance, this discrepancy between research findings and empirical practice poses a number of research questions that warrant rigorous empirical evaluation. We analyse the accuracy of different wrapper methodologies , which employ ex-post selection of multiple exponential smoothing candidate models for supply chain forecasting. We assess the effect of multiple meta-parameters on model selection accuracy in a multifactorial design, controlling for the error metrics (incl. MAE, MSE, MAPE, SMAPE) or information criteria (AIC, BIC), data partitions (in-sample vs. out-of-sample) and forecasting horizons (1-steap ahead vs. trace forecasts). Accuracy is assessed on 326 empirical time series from fast moving consumer goods manufacturer Beiersdorf, across multiple rolling origins and fixed forecasting lead time using multiple robust error metrics. Results are analysed across time series patterns (i.e. seasonal vs. non-seasonal; trended vs. non-trended), and data partitions of different length (in- vs. out-of-sample) in order to identify the data conditions under which different model selection schemes perform well. Results indicate that model selection based upon multiple step-ahead out-of-sample errors outperform other approaches.

Exponential Smoothing Methods improved by the Bootstrap

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This study describes the use of the Boot.EXPOS, a mix procedure for modeling and forecasting time series, when the initial model selection is based on thirty exponential smoothing methods (EXPOS). The selection of the most adequate EXPOS model is done by the AIC criterion and fitted residuals are obtained. The error component is isolated and investigated regarding its stationarity. If it is not compatible with this hypothesis, data transformation is required. Under stationarity hypothesis, the residual sequence is filtered by an autoregressive model, autoregressive coefficients are estimated and innovations are obtained. A bootstrapping scheme is then used over the centered residuals and a backward process for the reconstruction of the time series begins. When using the bootstrap, the key of success is to make sure that the resampled values correctly mimic the original ones. Under this principle, a new step was introduced in the procedure! An intuitive idea is that the original sample and the AR reconstructed sample would show the same variability pattern. A test for the homogeneity of the variances is performed. If the homogeneity hypothesis is rejected another resampling from the residuals is done and another AR reconstruction is performed. The EXPOS fitted values and the reconstructed series are used to obtain a sample path of the data. Forecasts are obtained using the initial EXPOS model selected in the first procedure stage. A case study of the performance of our procedure is presented. Some accuracy measures such as root mean squared error, mean absolute error and symmetric mean absolute percentage error are considered. The empirical study indicates that this approach has a good performance and is a good option when forecasting time series. An automatic procedure was built in R language, for which new functions need to be constructed.

Integrating Exponential Smoothing Method with Regressors

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The introduction of Holt's linear exponential smoothing method in 1950's was intended to generate forecasts based on the level and linear trend that represents growth over a time period. The underlying idea of this approach is to compute forecasts as sum of the past level and the estimated change in level based on a linear trend. We manipulate this idea to generate forecasts as sum of the past level and the estimated change in level based on a linear relationship with a set of regressors. It can be shown that the developed exponential smoothing model with regressors has an equivalent state space structure, so that the estimation procedure can be performed via the state space framework with single source of error. In addition to that, we comprehensively explain the estimation and initialization procedure as well as solutions to some related issues of possible pitfalls and forecast stability.

Empirical study results managed to show that this new technique is able to produce better forecasts than some other forecasting methods.

Exponential Smoothing and Variance Stabilizing Transformations

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The goal of this work is to investigate the effect of variance stabilizing transformations on point forecasts and predictive distributions that are produced by the exponential smoothing methods. We consider only linear innovations state space models that are combined with a function that has the potential to transform a time series into one with a constant variance. For example, a restricted Box-Cox function that permits only the values of 1 (no transformation), 0.5, and 0 (log transformation) is considered. The study is undertaken with the M3 data set.

EBC1

Invited session: Multivariate Models for Business Cycle Analysis I

Monday 27 June 11.00am-12.30pm   Room: RB211

Chair: Gian Luigi Mazzi

How Well Does the Yield Curve Predict Recessions? An International Comparison

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Over the last couple of decades, the yield spread has emerged among economists as the perhaps the single most popular predictor of recessions, based mostly on U.S. data. Yet, by the early 2000s, concerns were beginning to be expressed about the structural stability of the yield spread as a recession predictor. In the lead-up to the Great Recession, Wright (2006-07) added additional variables to univariate yield spread models in an effort to improve their forecasting performance, but the real-time results turned out to be poor. Using ECRI's international business cycle chronologies as benchmarks, we investigate the robustness of both univariate and multivariate models incorporating the yield spread as a predictor of recessions in several major economies, in addition to the U.S. The results indicate that the yield spread is not a reliable leading indicator of international recessions.

Cyclical Dynamics of Industrial Production and Employment: Markov Chain-based Estimates and Tests

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This paper characterizes the business cycle as a recurring Markov chain for a broad set of developed and developing countries. The objective is to understand differences in cyclical phenomena across a broad range of countries based on the behavior of two key economic times series – industrial production and employment. The Markov chain approach is a parsimonious approach that allows us to examine the cyclical dynamics of different economic time series using limited judgment on the issue. Time homogeneity and time dependence tests are implemented to determine the stationarity and dependence properties of the series. Univariate processes for industrial production and employment growth are estimated individually and a composite indicator that combines information on these series is also constructed. Tests of equality of the estimated Markov chains across countries are also implemented to identify similarities and differences in the cyclical dynamics of the relevant series.

A comparison of two multivariate methods of turning point detection

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Two main multivariate methods have been proposed to determine turning points. Harding and Pagan (2006) develop a multivariate procedure that is designed to formalize NBER business cycle dating procedures. In this approach a large number of series are evaluated according to the extent to which their turning points are synchronized. Ultimately a small number of highly synchronized series are selected. The central tendency of these turning points (as measured by the median distance) is identified and is marked as the reference cycle turning point. Stock and Watson (2010) develop a procedure for estimating turning points by 'aggregating' large datasets. They omit the step of selecting highly synchronized series and instead utilize a large dataset directly. The central step in their procedure is to select the reference cycle turning point as the mode of the distribution of turning points. Stock and Watson place considerable emphasis on the fact that their procedure yields a non parametric estimand. The objective of this paper is to compare and evaluate these two methods of multivariate turning point detection. The following questions are addressed. First, can turning points be given a population definition as argued by Stock and Watson? Or are turning points inherently features of sample paths as argued by Harding and Pagan? Second, is it correct to treat turning points as objects about which one can make statistical inference? Third, how large is the empirical difference between the Stock and Watson and Harding and Pagan definitions of reference cycle turning points.

A multivariate system for Euro area turning points detection

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Conducting a real-time detection of turning points for business and growth cycles is essential to ensure a reliable monitoring of the cyclical situation and to construct an effective early warning system. When considering the business and growth cycles, turning points follow the ABCD sequence. In a detecting exercise, the fulfillment of the ABCD sequence is not ensured if turning points indicators are developed independently for the business and growth cycles. This is mainly happens when the two indicators have different leads and/or lags respect to the turning points occurrence. The alternative ensuring the fulfillment of the ABCD is to construct a single indicator detecting simultaneously growth and business cycles. This paper presents a new multivariate indicator based on Markov Switching model dating the business and growth cycle of Euro area turning points. It discusses the main methodological issues rising when constructing this indicator: the selection of variables set relevant for both cycles and the identification of the appropriate number of regimes in the multivariate MS model. Also, the new indicator is compared in real-time with the turning points indicators already developed for the Euro area business and growth cycles (i.e. BCCI and GCCI). The main outcome of the exercise is that the multivariate indicator is timely in detecting business and growth cycle turning points compared to BCCI and GCCI. In particular, the timeliness improvement is more evident for the business cycle because the BCCI is lagging 7-9 months. Moreover, BCCI and GCCI do not show any false signal while the multivariate indicator shows a couple of false signals mainly occurring at the beginning of the estimation period. The results show the potential of the new indicator against the former ones, even if further work is needed to reduce the presence of false signals.

Invited session: Forecasting Value-At-Risk

Monday 27 June 11.00am-12.30pm   Room: RB212

Chair: Juan-Angel Jimenez

Value-at-Risk model based on Extreme Value Theory: Comparison with other models under the Basel Accord

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Since the Basel II accord, forecasting Value-at-Risk become a daily task of banks and other Authorized Deposit-taking Institutions (ADIs). These forecasts are used to determine capital requirements and associated capital costs of ADIs. Methods based on Extreme Value Theory (EVT) showed better performance in terms of unconditional coverage and independence in many comparative studies. In this work we compare, in terms of daily capital requirements and violation penalties under the Basel II accord, the performance of a new model based on the EVT, with other models based on EVT, GARCH-type models and the Riskmetrics model. We emphasize that with the indexes under study and taking into account the Basel penalty zones, we achieve much better results with this new model than with the well known Riskmetrics model.

How Risky is the Value at Risk?

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The recent financial crisis has raised numerous questions about the accuracy of value-at-risk (VaR) as a tool to quantify extreme losses. In this paper we present empirical evidence from assessing the out-of-sample performance and robustness of VaR before and during the recent financial crisis with respect to the choice of sampling window, return distributional assumptions and stochastic properties of the underlying financial assets. Moreover we develop a new data driven approach that is based on the principle of optimal combination and that provides robust and precise VaR forecasts for periods when they are needed most, such as the recent financial crisis.

A partitioned distribution of two-sided Weibull and asymmetric Laplace and forecasting financial risk

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The two-sided Weibull (TW) distribution can capture potential skewness and fat-tailed behaviour in the conditional financial return distribution, thus is an appropriate option for the purposes of forecasting Value at Risk (VaR) and conditional Value at Risk. However, TW can be bi-modal, which disobeys the empirical financial return series. A partitioned distribution with TW tails and an asymmetric Laplace distribution in the centre is developed to address this deficiency in TW. An adaptive mixture of Student's t (AdMit) method combined with Bayesian Markov Chain Monte Carlo scheme is devised for estimation, inference and forecasting. Simulation study demonstrates improved estimation of parameters from AdMit than a mixture of Gaussian proposal distribution. This distribution combined with GJR-GARCH volatility model is illustrated to forecast risk measures for four international stock markets, two exchange rates and one individual asset series, over a four year forecast period that includes the recent global financial crisis. The study finds that the partitioned distribution performs at least equally well for VaR and conditional Value at Risk as TW, both prior to as well as during and after the recent crisis, but with a more sensible centre.

International evidence on GFC-robust forecasts for risk management under the Basel Accord

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A risk management strategy that is designed to be robust to the Global Financial Crisis (GFC), in the sense of selecting a Value-at-Risk (VaR) forecast that combines the forecasts of different VaR models, was proposed in McAleer et al. (2010). The robust forecast is based on the median of the point VaR forecasts of a set of conditional volatility models. Such a risk management strategy is robust to the GFC because, maintaining the same risk management strategy before, during and after a financial crisis, would lead to comparatively low daily capital charges and violation penalties for the whole period. In this paper we present evidence to support the claim that the median point forecast of VaR is generally GFC-robust. We investigate the performance of a variety of single and combined VaR forecasts in terms of daily capital requirements and violation penalties under the Basel II Accord, as well as other criteria. We choose several major indexes, namely French CAC, German DAX, US Dow Jones , UK FTSE100, Hong Kong Hang Seng, Spanish Ibex35, Japanese Nikkei, Swiss SMI and US Standard and Poors500. . The GARCH, EGARCH, GJR, and Riskmetrics models as well as several other strategies are used for comparison. Backtesting is performed on each of these indexes, using the Basel II Accord regulations, for the period 2008-10, to examine the performance of the median in terms of the number of violations and daily capital charges, among other criteria. The median is shown to be a profitable and safe strategy for risk management, both in calm and turbulent periods because it provides a reasonable number of violations and daily capital charges. The median also performs well when the asymmetric linear tick loss function is considered

JUD1

Contributed Session: Judgemental Forecasting

Monday 27 June 11:00am-12:30pm   Room: RB213

Chair: Dilek Onkal

Group-based judgmental forecasting: development of a new research agenda

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We focus on the relative merits of different methods for aggregating individual forecasts, the advantages of heterogeneity in group membership, the impact of others' opinions on group members, and the importance of perceptions of trust. We conclude that opinion change after group-based deliberation is most likely to be appropriate where group membership is heterogeneous, minority opinion is protected from pressure to conform, information exchange between group members has been facilitated, and the recipient of advice is able – by reasoning processes – to evaluate the reasoning justifying proffered advice. Proffered advice is least likely to be accepted where the advisor is not trusted – indicated by having different perceived values to the recipient of the advice and being thought to be self-interested. In contrast, the outcome of a group-based deliberation is most likely to be accepted when there is perceived procedural fairness and the participants in the process are perceived as trustworthy.

Group Forecasts and Role-Playing

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Group forecasts play a special role in many organizations. Given the previous work highlighting the potential advantages of group processes in enhancing individual judgments, surprisingly little research has examined the judgmental forecasts given by groups. The current study reports the results of an experiment that compares the effects of role-playing on performance of group predictions and the associated forecast adjustment behaviour.

Consensus forecasts are elicited from structured groups with and without role playing. The findings reveal that members of the role-playing groups display a strong commitment to their assumed roles and demonstrate less agreement with consensus forecasts. Role-playing groups also leave a higher percentage of model-based forecasts unadjusted and when they do make an adjustment, it is significantly less than the groups without any assigned roles. Overall, the findings emphasize the importance of role framing on forecast adjustment and group forecasting behaviour. Implications for the accuracy and acceptance of group predictions are discussed and future research directions are proposed.

An Examination of Delphi Forecast Accuracy

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Multiple experts from groups are generally more accurate than those of individual experts in terms of forecast generation. However, group processes related to the interactions of group members often lead to suboptimal judgments. One of the solutions to this problem is to use the structured group technique such as the Delphi. Most Delphi studies show that it does lead to higher accuracy than statistized groups and interacting groups. However, very few tourism studies have investigated the forecasting accuracy of the Delphi approach. This paper aims to examine the accuracy of judgmental forecasts based on the Hong Kong tourism demand data. Three hypotheses are proposed as: (1) accuracy increases with the number of survey round increase, (2) forecasts weighted by self-assessed scores are more accurate than unweighted forecasts, and (3) forecast summarized from robust estimates of location are more accurate than nonrobust measures. The quarterly forecasts of total visitor arrivals along with the arrivals from six source markets (i.e. Mainland China, Japan, USA, UK, Australia, and India) in Hong Kong up to 2015 are generated using the Delphi technique. Highly-qualified panels of experts are selected from different stakeholders of the tourism industry in Hong Kong, including accommodation, travel trade, transport, cruise, tourist attractions and academic institutions. Based on the past forecasting performance of statistical models, the forecasts with the lowest MAPEs are selected as the baseline forecasts. Both equal and unequal weights are adopted to combine experts' predictions. As for the latter, subjective confidence and self-assessment values assigned by panelists are used to weigh experts' judgments. Performance is evaluated according to MAPEs. To test the proposed hypotheses, analysis of variance and the non-parametric statistical tests are applied to examine the forecast accuracy among different expert weighting schemes. Furthermore, the forecast accuracy of the Delphi method is compared with the baseline forecasts.

Does the Delphi process lead to increased accuracy in group-based judgmental forecasts?

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We investigate the relative impact of internal Delphi process factors (panelists' degree of confidence, expertise, majority/minority positioning) and an external factor (richness of feedback) on opinion change and subsequent accuracy of judgmental forecasts. We found that panelists who had low confidence in their forecast and/or who were in a minority were more likely to change their opinion than those who were more confident and/or in a majority. The addition of rationales to the numeric feedback had little impact upon final forecast despite quality of panelists' rationales being significantly positively correlated with accurate forecasts, and thus could have been used to improve forecasts. Rather, the effect of rationales was similar to that of confidence: to pull panelists towards the majority opinion regardless of its correctness. We conclude that majority opinion is the strongest influence on panelists' opinion change in both the 'standard' Delphi, and Delphi-with-reasons. We make some suggestions about variants of the Delphi-with-reasons technique that might help reduce majority influence and thereby permit good arguments to exert their proper pull on opinion change, resulting in significant improvement in accuracy.

ICT1

Invited session: Information Communication Telecommunications

Monday 27 June 1:45-2:45pm   Room: RB203

Chair: Mohsen Hamoudia

Simultaneous Indirect Network Effects: Smartphone and its Application Markets

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The effect of indirect network externality, especially on systematic markets, such as PDA or CD player market, in which hardware and software markets coexist, has been studied for a long time. Many former studies simply showed the existence of indirect network externalities between hardware and software markets. However, they neither examined the essential of indirect network externality nor tried to develop a model that structurally handles its effect on both the diffusion process of hardware market and the growth process of software market. To fill these voids, this study introduces and models two propositions: (1) indirect network externality stimulates the speed of the diffusion and growth processes and (2) indirect network externality increases the ceiling level of markets. In order to capture the interdependent nature of the markets, the diffusion and growth processes are simultaneously modeled. The proposed model is applied to smartphone and its application market data for an empirical example.

Forecasts of Wireless vs. Wireline Broadband Access

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With the introduction of 4G technology, wireless may finally have the capacity to realistically compete with wireline broadband access (e.g. DSL, FTTx and HFC) on a large scale. Considering the spectral efficiency of 4G, spectrum becoming available, range at various frequencies, equipment costs and traffic loads, we conclude the following: wireless broadband could universally replace low end DSL; in urban/suburban areas, wireless broadband can compete with wireline for very highspeed (VHS) broadband (10 Mb/s+) and some households may choose wireless exclusively, but wireless is unlikely to be a complete replacement; and in rural areas, wireless can compete with wireline for VHS broadband, many households may choose VHS broadband exclusively and additional wireline VHS deployment may be delayed, especially by telecom operators. The analysis is focused on the U.S. where WiMax and LTE are being deployed across the continent, but the fundamentals of wireless and broadband demand are universal.

To have or not to have Internet at home: implications for online shopping

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This paper analyzes the individual decision of online shopping, in terms of socioeconomic characteristics, internet related variables and location factors. Since online shopping is only observed for internet users, we use the two-step Heckman\'s model to correct sample selection. We argue that one of the relevant variables to explain online shopping, the existence of a home internet connection, can be endogenous. To account for this potential endogeneity, we jointly estimate the probability of online shopping and the probability of having internet at home. The dataset used in this paper comes from the Household Survey of ICT Equipment and Usage, conducted by the Spanish Statistical Office on an annual basis. Our analysis covers the period 2004-2009. Our results show that not accounting for the endogeneity of having internet at home, yields to overestimate its effect on the probability of buying online. This finding can be important in the design of public policies aimed at enhancing e-commerce through providing households with internet connection at home. We also show that, compared to other variables that are also relevant for online shopping, the effect of internet at home is quite small.

STR2

Contributed Session: Strategic forecasting

Monday 27 June 1:45-2:45pm   Room: RB204

Chair: Jean Biem

Forecasting of the Ukrainian tracking industry development

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The realization of higher performances of the overall Ukrainian Transport System for the purpose of integration into Europe is an integral part of foreign policy of modern Ukraine on the background of the actual transition economy. To realize it one needs to concentrate efforts on key directions of development. The study presents forecast of tracking industry development in Ukraine on the base of time series, describing cargo transition by different kinds of transport and some macro indexes. The main goal is to determine the potential opportunities of the important industrial sector and to analyze relations between indexes of this industrial sector and economy as a whole. The elaboration of percentages of charges of the transport modes of Ukraine is therefore envisaged to develop future Ukrainian transport policies. The analysis investigates the monthly time series of the transport volume of the cargo transit, generated by the main four components of the tracking industry of Ukraine, namely road, pipeline, water and railway transport, and is supplemented by analysis of an important macro indexes, namely, volume of realized product, gross domestic product and turnover. Results of the study can provide useful insight for the investment of transport development in Ukraine.

Business process reengineering in public sector: forecasting its effectiveness through simulation

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This study investigates business process reengineering in public sector towards e-government. E-government is becoming increasingly important in the provision of services to citizens, businesses and other agencies. The purpose of this paper is to map and reengineer business processes, both introvert and extrovert, in order to improve the provision of services in local government. We are examining business process modeling and reengineering methodologies and their application, along with case studies in public sector. We are proposing the implementation of business process reengineering to selected processes according to specific criteria, after the development and application of a simulation model in order to forecast the effectiveness of the proposed changes and assist public sector's decision makers.

Africa's Development and Global Equilibriums in the 21st Century: Geostrategic Challenges of a Non C

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In its 2008 report on Global Trends 2025, the United States National Intelligence Council predicts that Africa will be even more globalized and more troubled in the next decades than it is today. Far from being isolated, this picture reflects a consensual forecast. In this view, Sub-Saharan Africa in particular will remain the most vulnerable region on earth in terms of climate crisis, population stresses, economic challenges, civil conflict, and political instability. Any impact the continent is likely to have on global issues will be determined by these dynamics that are also the lens through which China and emerging powers see Africa as they increase their exchanges with, and influence on, the continent. However, these major studies appear to be missing decisive transformative dynamics, perhaps in the same way as Western sovietologists or sinologists in the 1970s and 1980s failed to predict the collapse of the Soviet Union or the staggering development of China. Looking at new political, social and economic transformations on the ground and applying methods of strategic forecasting to the relationship between such dynamics and global equilibriums, this paper challenges the conclusions of the consensual forecast, highlighting how deeply Africa would influence global matters both in case the status quo persists and in case the continent unexpectedly develops. Through grassroots practices and networks as well as marginal government policies, current attempts at undoing the rentier specialization of African economies are creating new possibilities for the development of manufacture to meet basic needs on the continent. What are the paths through which this trend could result in agricultural and industrial transitions? Examining structural dynamics, players and possible outcomes, the paper elaborates alternative scenarios on how Africa's development (or continued underdevelopment) would transform global equilibriums in terms of food crisis, raw material markets and the global climate crisis.

TSA2

Contributed Session: Time Series Analysis

Chair: Peg Young

Efficient Bayesian Inference in Structural Second Price Common Value Auctions

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Structural econometric auction models with explicit game-theoretic modeling of bidding strategies have been quite a challenge from a methodological perspective. We develop an efficient Bayesian analysis of the hierarchical Gaussian common value model with stochastic entry introduced by Bajari and Hortacsu (2003). A key component of our approach is an accurate analytical linear approximation of the equilibrium bid function. The approximate bid function can be inverted and differentiated analytically, leading to a fast and numerically stable evaluation of the likelihood function. We use a Bayesian variable selection algorithm that simultaneously samples the posterior distribution of the model parameters and does inference on the choice of covariates. The methodology is applied to simulated data and to a carefully collected dataset of 1000 coin auctions at eBay. It is demonstrated that the Bayesian algorithm is very efficient and that the approximation error in the bid function has virtually no effect on the model inference. The structural estimates are reasonable, both in sign and magnitude, and the model fits the data well. Finally, we document good out-of- sample predictions of auction prices from the estimated model.

Smooth Forecasting of Evolutionary Panels

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In this paper we consider the problem of forecasting a multivariate process whose second order structure smoothly varies over time. In particular, we predict the common components of an evolutionary factor model. We factorize the evolutionary loadings as the product of a scalar smooth time-varying component that captures the long run common volatility, and ARMA filters describing the short run stationary dynamics. Specific non-pervasive behaviours of returns are left in the idiosyncratic components. The estimation of the common volatility is based on the spectral decomposition of the evolutionary covariance, whereas the prediction of the common components is based on the spectral decomposition of the evolutionary (i.e. time-varying) spectrum. We estimate the common volatility and predict the common components in a fully non-parametric way, and derive the asymptotic properties of our estimators. The performance of the methodology is illustrated by means of simulation exercises. Finally, we provide an application to US macroeconomic data and to a panel of equity returns on the S&P 500 constituents.

Empirical results show that there is a strong evidence of a factor structure and that, a large portion of the overall volatility is explained by the common volatility of the market.

Masking of Volatility by Seasonal Adjustment

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We report that the X-12 ARIMA and TRAMO-SEATS seasonal adjustment methods consistently under estimate the variability of the differenced seasonally adjusted series. We show that under estimation is due to a non-zero estimation error in estimating the seasonal component at each time period, which is the result of the use of low order seasonal filter in X12-ARIMA for estimating the seasonal component. Hence, we propose the use of high order seasonal filter for estimating the seasonal component, which helps reducing the estimation error noticeably, helps amending the under estimation problem, and helps improving the forecasting accuracy of the series. In TRAMO-SEATS, Airline model is found to deliver the best seasonal filter among other ARIMA models.

A study of seasonality in transportation data – Deseasonalizing Vehicle-Miles Travelled

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Vehicle-miles traveled by cars, trucks and buses on public roads are used as a key measure of roadway use. The national U.S. measure of vehicle miles travelled (VMT) is computed by U.S. Department of Transportation's Federal Highway Administration (FHWA) and published monthly. Since seasonality is a major source of variability in the monthly VMT data, the Bureau of Transportation Statistics (BTS) has been asked by FHWA to deseasonalize VMT data for monthly publication on FHWA's website. In order to deseasonalize the data with X12 ARIMA, dummy variables need to be created that handle travel on holidays that may cross between two months (e.g., Easter, Thanksgiving, Christmas/New Year's). This presentation discusses the study of holiday effects on VMT data and how we estimate the impact of such holidays on highway travel.

EVA1

Contributed Session: Evaluation

Monday 27 June 1:45-2:45pm   Room: RB207

Chair: Konstantinos Nikolopoulos

Factors Affecting Forecasting Accuracy

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The purpose of this research is to identify the factors affecting the forecasting accuracy of major time series methods. In order to achieve such a purpose, a very large number of series is generated that vary on six discrete ranges in terms of their seasonality, cycle, trend and randomness as well as their number of observations. In total, there are 7,776 (65) combinations being considered with 1,000 time series being generated for each. The forecasting methods tested are Naive, Naive2, Single Exponential Smoothing, Holt, Damped, Holt-Winters, the Theta model as well sophisticated ones including those used by commercial packages. There are several measures of forecasting accuracy being calculated including symmetric MAPE, MASE and percent better. Consequently a two way analysis of variance is being used to determine consistent factors affecting the accuracy of various forecasting methods and accuracy measures. The generation characteristics of the time series are those found in large numbers of real life time series.

Implementation of Ensemble Prediction Systems post-processing methods, for electric system management

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This paper has for objective to study the behavior and the integration of the ensemble prediction systems (EPS) so that we can use them on the temperature forecasts provided by Meteo-France. The principle of the EPS is to run several scenarios of the same model with slightly different input data to simulate the uncertainty. We implement statistical post-processing methods to improve its use for electric system management, at EDF France. The methods we tested are the Best-Member method and the Bayesian method. Their results are compared using scores verifying the skill and/or the spread of the EPS: MAE, RMSE, Ignorance Score, CRPS, Talagrand Diagram, Reliability diagram. The Best-Member method is proposed by Fortin as an improvement of the one build in 2002 by Roulston and Smith). The idea is to design for each lead time in the data set, the best forecast among all the forecasts initially provided, to construct an error pattern using the errors made by those \best members\ and then to dress all the members of the initial prediction system with this error pattern. This approach fails in cases where the initial prediction system is already over dispersive. It is why another sub method was created. It allows to dress and weight each member differently by class of statistical order. The Bayesian method has been proposed by Raftery. It is a statistical method for post processing model outputs which allows to provide calibrated and sharp predictive PDFs even if the output itself is not calibrated.

The M4 Competition: Facts, Innovations and the way Forward

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The role and value of forecasting is constantly under scrutiny and its contribution to the societal welfare has often been challenged. The latest financial crisis raised even more questions with regards to the true underlying value of forecasting as a field. Consequently, it may be argued that the biggest challenge we face is not the introduction of additional methods, rather than objectively evaluate available empirical evidence in the field of forecasting and cognitive psychology in order to provide decision and policy makers with evidence based information. Towards this end, the M4-Competition (10111 series) is here to further study the accuracy, validity and for the first time utility of various forecasting methods. In particular: Given their growing importance, the Internet and intermittent/count series are being introduced as separate categories There is a considerable emphasis being placed on uncertainty; this is to be facilitated through the construction of confidence intervals for all methods The empirical utility of the forecasts will be separately analyzed and contrasted to forecast accuracy. Sales forecasts are to be analyzed also with regards to their stock control implications while financial series with their trading implications respectively. An evaluation of published judgmental forecasts will be made to study their accuracy and uncertainty. A major objective will be to ensure the objectivity and replicability of the results. The competition runs throughout 2011 with multiple releases every quarter, followed by a 'live' phase on 111 highlight series for three more years.

ECO1

Contributed Session: Econometrics

Monday 27 June 1:45-2:45pm   Room: RB210

Chair: Antonio Aznar

Optimal Forecasting of Noncausal Autoregressive Time Series

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In this paper, we propose a simulation-based method for computing point and density forecasts for univariate noncausal and non-Gaussian autoregressive processes. Numerical methods are needed to forecast such time series because the prediction problem is generally nonlinear and no analytic solution is therefore available. According to a limited simulation experiment, the use of a correct noncausal model can lead to substantial gains in forecast accuracy over the corresponding causal model. An empirical application to U.S. inflation demonstrates the importance of allowing for noncausality in improving point and density forecasts.

Efficiency of Data Mining Methods and Different Types of Data

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Data mining, recovering of predictive information from large databases, is a powerful tool with great potential to help us focus on the most important information in set of data. It is obvious that the data mining tools have a wide area of applications. They help us to solve many classification as well as regression problems that arise in economy, financial resorts, demography but also in chemical engineering, biomedicine and in many other subjects. For example in today's economy data mining could be an essential instrument and can play the key role in the effort to retain business productivity, minimized risk, maximized returns as well as reduced bankruptcy of the companies. In theoretical chemistry data mining tools can be used to predict the molecules properties or improve computer-assisted drug design.

The main goal of this contribution is to compare an efficiency of different data mining models build on different type of data. Tree based algorithms are applied to predict financial distress of Slovak companies and the same models are applied to predict the biological activity of molecules, potential candidates for new drugs. In these tree structures, leaves represent classifications and branches represent conjunctions of features that lead to these classifications.

What can economists estimate and predict being Economics a Non-experimental Science?

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Are the economist's conscious of the non-experimental character of their data? Does this non-experimental character influence their decisions when building a model? It seems that when economists set the object of the estimation process, they are hardly worried about the non-experimentality of their data. They propose to estimate structural parameters or reduced form parameters close to what a natural scientist would do. A structural parameter is thought to give the direct and individual effect-the causal effect- of a variable on another variable. A reduced form parameter is a complex combination of structural parameters that summarizes the interrelationships that are implicit in a given structural form. In many situations, economists think that they can estimate structural parameters and that they can assess the validity of the estimation by considering a priori information about the sign and size of these parameters. However, unless there is a coincidence between the frequency of the causal process and the frequency of the observed data, the possibility of estimating a structural parameter does not exist. In this paper, we propose to estimate some linear combinations of the parameters of the General Linear Model that are easily interpretable and that can be estimated with a high level of accuracy. We propose interval estimates whose centre are the estimations of the parameters calculated from a Simple Model while the limits of the intervals are determined using the standard deviation obtained from a GLM whose variables have been determined by means of the adjusted coefficient of determination. The results are extended to predict the value of a dependent variable in that particular situation in which we know only the future value of one of the regressors and, for the rest of the regressors, we assume that their future values equal the conditional expectation of those regressors given the value of the known regressor.

Invited session: Uncertainty in Macroeconomic Forecasting I

Monday 27 June 1.45-2.45pm   Room: RB211

Chair: Filippo Moauro

Inflation Forecast Uncertainty in the Crisis: The Bank of England Survey of External Forecasters, 20

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Since 1996 the Bank of England has conducted a quarterly Survey of External Forecasters and published the resulting survey average forecasts in its quarterly Inflation Report. Like the better-known US Survey of Professional Forecasters, it asks respondents for both point forecasts (central projections) and density forecasts of inflation and growth. Initially there were two fixed-event forecast questions, with target dates fourth quarter (Q4) this year and Q4 next year, but a third question was soon added, asking for a fixed-horizon forecast two years ahead. The Bank also follows the practice of the SPF in making the individual responses to the survey, made suitably anonymous, available for research purposes. To date we have published four articles on different research questions illuminated by these data, mostly based on the surveys up to November 2005, with associated inflation and growth outcomes over the NICE decade. An important break occurred with the May 2006 survey questionnaire, which replaced the two fixed-event target dates with additional fixed-horizon targets one and three years ahead. And shortly thereafter the UK began to experience greater inflation volatility. This paper focuses on the inflation forecast uncertainty reported by respondents to the survey over this period: it is seen that the aggregate responses published in the Inflation Report mask considerable, and persistent, heterogeneity in the individual responses.

Density Forecasts Combination for Turning Point Detection

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This paper proposes a forecast density combination approach for predicting turning points of the business cycle. We assume that a set of multivariate models is used for the analysis of the business cycle and for the prediction of the turning points in the cycle. A suitable combination of the predictive probabilities is then used in order to obtain a possibly better prediction of the turning points. The weights of the combination scheme belong to the unit interval and can be interpreted as posterior model probabilities. A Bayesian approach has been applied to estimate the model probabilities and to forecast the turning points. A comparison has been carried out, in terms of statistical accuracy, between the individual model and the Bayesian model averaging forecasts for the turning points of the US business cycle.

Evaluating the informational content of univariate, nonlinear and multivariate real-time output gap

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There exists a range of univariate, nonlinear and multivariate detrending methods to identify and estimate trends and cycles. Structural VAR, Unobserved Components, Markov switching and nonparametric detrending methods have all been considered. There is, effectively, "model uncertainty". This manifests itself at a practical level in different, and potentially contrasting, quantitative assessments about the trend and cycle. Since inference about trends and cycle can be sensitive to measurement, it is important to compare and contrast estimates obtained using alternative methods. This dissension across alternative (competing) estimates of the output gap is familiar to macroeconomists. In practice we know that policy-makers consult various estimators to inform their judgement. This provides a rationale for model-averaging. When the output gap is used for a specific purpose, like modelling or forecasting interest-rates or alternatively inflation, one should consider combining information across these alternative estimators. However, while it is well established that combining competing individual point forecasts of the same event can deliver more accurate forecasts, in the sense of a lower RMSE, little attention has been paid to the combination of cyclical estimates acknowledging their uncertainty. Accordingly, we propose a simple method of combining information across alternative cyclical estimates that delivers the "optimal" pooled or combined output

gap density estimator. It is important to present density estimates for the output gap, rather than point estimates, since interest may not focus only on the central tendency of the output gap. We might be interested, for example, in the probability of a (one-period) recession. We then compare the informational content of various univariate, nonlinear and multivariate decompositions. We conduct recursive out-of-sample simulations using real-time Euro Area data to examine the ability of the detrending methods to density forecast future values of output growth and inflation. Both objectives are appropriate means of evaluating the quality of alternative cyclical estimates.

FIN2

Contributed Session: Finance

Monday 27 June 1:45-2:45pm   Room: RB212

Chair: Harald Schmidbauer

Discriminant Analysis and the Identification of Potential Value Stocks

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The last three decades have witnessed stock market booms and busts, economic prosperity and downturns, including the global financial crisis in 2008 that sent many stocks tumbling and brought down revered financial institutions. Although the market seems to be more positive than it was 18 months ago, more than ever investors are more cautious and astute in their stocks selection. While there is a variety of stock selection approaches on the market today, the approach used in this study is built around identification of stocks with potential high value. Theoretically, a high-value stock will have a sound balance sheet that shows a good financial health. Indicators such as Dividend Yield, Price per Earnings Ratio, Beta, Earning Stability, Debt/Equity Ratio, Cash Flow, Book Value, Return on Assets and Return on Equity etc, are often examined to supplement an investor's decision in equity markets. This study examines the ASX listed companies, in an attempt to discriminate between stocks based on their potential value to shareholders using financial statement data. Discriminant analysis technique is employed here to identify value stocks that potentially will give greatest economic return for investors. The implications of the findings will be discussed in relation to the benefits for the Australian stock market and might have extensive relevance to other overseas markets, in order to maximize their investment return.

Forecasting Banking Failure with ANN

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The bankruptcy prediction of a bank is an important and widely studied topic, since it may have significant impact on bank lending decision and profitability. This survey presents an Artificial Neural Network algorithm to forecast failure in a Greek bank. The key scope is the development of an ANN bankruptcy prediction model which includes macroeconomic variables, related to financial systemʼs structure, as well as banking data such as liquidity ratio, loan/deposit ratio, low net profit margin, change ratio of revenues and expenses. The model works as a useful forecasting tool for financial institutions, allowing assessment and comparison with their Business Plans. It performs well and provides valuable information about the future viability of large banks. Preliminary results contrast the performance of the proposed model with linear models.

Robust Trading Rule Selection and Forecasting Accuracy

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Trading rules performing well on a given data set seldom lead to promising out-of-sample results,
a problem which is a consequence of the in-sample data snooping bias. Efforts to justify the selection of trading rules by assessing the out-of-sample performance will not really remedy this predicament either, because they are prone to be trapped in what is known as the out-of-sample data snooping bias. Our approach to curb the data-snooping bias consists of constructing a framework for trading rule selection using a-priori robustness strategies, where robustness is gauged on the basis of time-series bootstrap and multi-objective criteria. This approach focuses thus on building robustness into the process of trading rule selection at an early stage, rather than on an ex-post assessment of trading rule fitness. Intra-day FX market data constitute the empirical basis of our investigations. Trading rules are selected from a wide universe created by genetic algorithms. We show evidence of the benefit of this approach in terms of indirect forecasting accuracy when investing in FX markets.

Contributed Session: Judgemental Forecasting

Monday 27 June 1:45-2:45pm   Room: RB213

Chair: Nigel Harvey

The Role of the Individual in the Implementation of a Forecasting Support System

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As with other business-related academic areas, the gap between forecasting theory and real world practice remains stubbornly large. Factors which can determine the successful implementation of an information system, including forecast support systems, are well documented at the organizational level. However, the literature is less comprehensive on the relationship between implementation and the individual. The following paper details the attempt to implement a theory-based forecasting system into several organizations. In each case, the willingness of an individual to adopt and utilize the system is key. The paper summarizes five case studies where individuals are encouraged to enhance their market knowledge and forecasting ability through system use. Each case study is set against Porter and Lawler's expectancy theory to aid identification of key implementation factors. The research confirms that an individual's abilities and traits, as well as perceived role, can govern the level of input they will dedicate to the implementation process.

Length Effects in Judgmental forecasting of various time series types
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The experiment examined forecasting performance when series of different lengths were presented to participants. The best forecasting occurred with the longest time series and an inverted U-shaped relation connected series length to accuracy. Furthermore, the version of anchoring and adjustment heuristic used to make forecasts depended on both series' length and series' type. For highly autocorrelated series people adjusted conservatively for all lengths while for seasonal, trended and random series they adjusted away from the last data point for long lengths.

Factors influencing the effectiveness of outcome feedback in judgmental forecasting

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We report an experiment designed to examine how learning via outcome feedback can be optimized in judgmental time series forecasting. Our first hypothesis was that giving people feedback not of actual outcomes but of what those outcomes would be if not perturbed by noise would be beneficial. This is because it would better reveal the pattern in the signal. Our second hypothesis was that giving people feedback about more distant forecast horizons (last four outcomes of eight that were forecast) would facilitate performance more than giving them feedback about closer horizons (first four outcomes of eight that were forecast). This is because the error signal would be larger. Our third hypothesis was that giving people complete feedback (i.e. feedback for all eight outcomes) would be no better – and may even be worse – than giving them a reduced amount of feedback (i.e. feedback only for alternating outcomes). This is because there is evidence to suggest that processing feedback is itself cognitively demanding. One hundred and forty-eight participants took part in the study. They made forecasts for both linear and positively accelerating time series. In our design, they received eight blocks of training trials with feedback and then four blocks of test trials without feedback. This was to ensure that the test trials were able to measure effects of feedback on learning uncontaminated by its effects on current performance. The results demonstrated that (1) providing noise-free feedback was marginally better than providing feedback of the actual outcomes in which noise had not been removed; (2) providing feedback for the last four forecasts was more useful than providing it for the first four: it helped participants to avoid trend-damping errors in accelerating time series; and (3) receiving feedback for alternating outcomes was as beneficial as receiving it for all outcomes.

K2

Plenary Session: Keynote Speech and IJF Editor's Invited Paper

Monday, 27 June, 3:15-4:15pm   Room: RB101

Chair: Rob Hyndman, Monash University, Australia

Statistical Learning with Large Numbers of Predictor Variables

Jerome Friedman

Stanford University, United States

Many present day applications of statistical learning involve large numbers of predictor variables. Often that number is much larger than the number of cases or observations available to train the learning algorithm. In such situations traditional methods fail. Recently new techniques based on regularization have been developed that can often produce accurate learning models in these settings. This talk will describe the basic principles underlying the method of regularization and then focus on those methods exploiting the sparsity of the predicting model. The potential merits of these methods are then explored by example.

Dr. Jerome Friedman is one of the world's leading researchers in statistics and data mining. He has been a Professor of Statistics at Stanford University for nearly 20 years and has published on a wide range of data-mining topics including nearest neighbor classification, logistical regressions, and high dimensional data analysis. His primary research interest is in the area of machine learning.

ICT2

Invited session: Information Communication Telecommunications

Monday 27 June 4:25-5:25pm   Room: RB203

Chair: James Alleman

An Investigation of Leapfrogging and Web 2.0 Implementation

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This paper investigates the leapfrog phenomenon, particularly late adopters of the Internet bypassing early Internet adopters in the implementation of Web 2.0 in tourism. Even though the Diffusion of Innovation theory covers many aspects of innovation adoption and implementation, implementation stage research remains sparse and perhaps no research has investigated the leapfrog phenomenon across different adopter categories. Thus, this study used a software robot to generate reports on Web 2.0 and User Active Features (UAF) by Swiss tourism websites. Moreover, this study used the Wayback Machine to classify website adopter categories and then investigating the leapfrogging phenomenon across adopter categories. The results suggest a link between adopter categories and the odds of implementation of at least one UAF or Web 2.0 feature. However, the findings only showed a slight leapfrogging phenomenon between Laggards and the Late Majority in the UAF model. This research helps fill the gap on implementation stage research by the analysis of Web 2.0 features implemented in the tourism sector.

Long-Term Mobile broadband Traffic and Subscription forecasts

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Mobile broadband traffic has since the introduction increased exponentially. However, the mobile broadband network has definite traffic bottlenecks. The system capacity of the radio part of the base station and the transport capacity from the base station may limit the carried mobile traffic. The mobile broadband network is planed and dimensioned based on busy hour traffic. Long-term forecasts have been developed for the mobile busy hour traffic. The long-term traffic forecasts consist of long-term forecasts of number of subscribers (penetration) and long-term forecasts of busy hour traffic forecasts per subscriber. The long-term forecasting model for mobile penetration consists of separate forecasting models for the business market and the consumer market. In addition each market is divided in different subscription types like PC based subscriptions called Large Screen and handset based subscription called Small Screen and advanced handsets like iPhone and Android. Separate penetration forecasts are developed for the different subscription classes up to 2015. The forecasts are dependent on the evolution of tariff structure and there are definite uncertainties because of this evolution. The overall long-term penetration forecasts for the business and the consumer market is based on four parameter Logistic models. An overview of driving factors for the traffic growths is given. The traffic also depends significantly on type of devices. The long-term busy hour traffic forecasts per user are developed for the classes Large and Small Screen and also mobile data traffic for users without specific subscription contracts. This traffic is called Pay as you go traffic. The total traffic forecasts for mobile broadband show an explosive traffic growth which need continuously upgrading of capacity and introduction of higher capacity systems in the mobile broadband networks.

Forecast of Over-the-Top Video Demand

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Over-the-Top (OTT) video represents a potentially disruptive force in the market where pay-TV providers (cable companies, satellite companies) provide subscription services to households for video services. OTT is the ability to obtain video services over the internet. This includes movies via Netflix and Amazon, TV shows through Hulu and video through 100's of internet sites. Currently, pay-tv's share is close to 88%. A number of analysts see OTT as the next stage of "cord-cutting," the first being telephone cord cutters. Telephone cord-cutters now represent over 25% of the market. Is video cord-cutting next? This paper looks at the demand for OTT. Using data from a monthly OTT tracking study of over eight thousand households per month conducted by Centris, the paper looks at whether OTT is a substitute or a complement to existing Pay-TV services. The paper looks at a household's willingness-to-pay for OTT services along with the demand for broadband, since broadband is a complementary good for OTT. Scenarios are developed to forecast the impact based on relative prices, cross-elasticities, demographics and other factors.

SUP1

Contributed Session: Supply Chain

Monday 27 June 4:25-5:25pm   Room: RB206

Chair: Juan R Trapero

Forecast errors and inventory performance under forecast information sharing

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Previous research has shown that the forecast accuracy is to be distinguished from the performance of the forecasts when utility measures are employed. This is particularly true in an inventory management context, where the interactions between forecasting and stock control are not yet fully understood. In this paper, the relationship between forecasting performance and inventory implications is explored under an ARIMA representation of the demand process. Two distinct scenarios are incorporated in our analysis: Forecast Information Sharing (FIS) and No Information Sharing (NIS) in a two-stage supply chain. We approach the problem analytically and by means of simulation. The validity of the theoretical results is assessed on a real sales dataset from a major European superstore. The results indicate that the gain in accuracy from Forecast Information Sharing depends on the demand process. The translation to inventory savings then depends on the magnitude of the forecast accuracy improvement, regardless of the demand process. Insights into pertinent managerial issues are also offered, and our paper concludes with an agenda for further research in this area.

Intermittent demand: linking forecasting to inventory obsolescence

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Count Data - Intermittent Demand The standard method to forecast intermittent demand is that by Croston. This method is available in ERP-type solutions such as SAP and specialised forecasting software packages, and often applied in practice. It uses exponential smoothing to separately update the estimated demand size and demand interval whenever a positive demand occurs, and their ratio provides the forecast of demand per period. The Croston method has two important disadvantages. First and foremost, not updating after (many) periods with zero demand renders the method unsuitable for dealing with obsolescence issues. Second, the method is positively biased and this is true for all points in time (i.e. considering the forecasts made at an arbitrary time period) and issue points only (i.e. considering the forecasts following a positive demand occurrence only). The second issue has been addressed in the literature by the proposal of an estimator (Syntetos-Boylan Approximation, SBA) that is approximately unbiased. In this paper, we propose a new method that overcomes both these shortcomings while not adding complexity. Different from the Croston method, the new method is unbiased (for all points in time) and it updates the demand probability instead of the demand interval, doing so in every period. The comparative merits of the new estimator are assessed by means of an extensive simulation experiment. The results indicate its superior performance and enable insights to be gained into the linkage between demand forecasting and inventory obsolescence.

Analysis of judgmental adjustments in presence of promotions

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Manufacturing firms are fundamental in supporting most modern economies. Such companies have to face an increasingly competitive environment due to world globalization. Under such circumstances, improvements on supply chain management can lead to obtain a competitive advantage. Within supply chain management SKU demand forecasting is of paramount importance to optimize firm strategies. Sales forecasting is a complex topic due to promotions and shorter life cycles. Generally, a particular type of a Decision Support System, known as a Forecasting Support System (FSS) is employed to prepare the forecasts. These FSSs integrate a statistical forecasting approach with managerial judgment from forecasters in the organization. The manager\'s judgment is an important element within the forecasting business. In fact, managers may add some information to the final forecast which is difficult to include in a statistical model like a future product promotion and consequently improve the forecasting accuracy. Despite the importance of judgment and promotions, the literature devoted to study its relationship on the forecasting accuracy is scarce. The present work reports an analysis of the managerial adjustments accuracy when promotions are taking place. Firstly, an exploratory analysis will quantify the improvement of the adjusted forecast with regards to the system forecast. Secondly, intervention analysis and

transfer functions will be used to find out whether judgmental adjustments can be substituted by mathematical models when referring to promotions and finally. Real data weekly sampled from a manufacturing company is used to illustrate the results.

Contributed Session: Nonlinear Methods

Monday 27 June 4:25-5:25pm   Room: RB207

Chair: Dick van Dijk

Experimental Investigation of Forecasting Methods Based on Universal Measures

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We experimentally investigate a method to construct forecasting algorithms for stationary and ergodic processes based on universal measures (or the so-called universal data compressors), which was suggested in B. Ryabko Compression-Based Methods for Nonparametric Prediction and Estimation of Some Characteristics of Time Series, IEEE Transactions on Information Theory, v. 55, n. 9, 2009, pp. 4309-4315. We show that this method outperfrom the state of the art methods on such problems as predicting the sunspot numbers and some other solar characteristics.

Tree-structured Smooth Transition Vector Autoregressive Models – STVAR-Tree

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The main goal of this paper is to introduce a nonlinear multivariate model, which combines the STVAR (Smooth Transition Vector Autoregressive) model with the CART (Classification and Regression Tree) method and use it for generating scenarios and forecasting. The resulting model is a Tree-Structured Vector Autoregressive model with Smooth Transition, called STVAR-Tree, which is based on the concept of multiple regimes, defined by binary tree. The model specification is based on Lagrange Multiplier tests. Thus, the growth of the tree is conditioned on the existence of nonlinearity in the time series, which indicates the node to be split and the corresponding transition variable. In each division, linear parameters are estimated by Multivariate Least Squares, and nonlinear parameters

by Non-Linear Least Squares. As a way of checking the STVAR-Tree model, several Monte Carlo experiments were performed in order to see the functionality of the model estimation. Best results were obtained with medium and large samples. Besides, the STVAR-Tree model was applied to Brazilian time series of Rivers Flow and electricity spot price. In the first study, the model was statistically compared to the Periodic Autoregressive (PAR) model and had a much higher performance than the competitor. In the second case, the model comparison was with Neural-Fuzzy Modeling and the STVAR-Tree model won in one of the four series. Adding both the experiments and the two applications results we conclude that the STVAR-Tree model may be applied to solve real problems, having good results.

Nonlinear Forecasting With Many Predictors Using Kernel Ridge Regression

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This paper puts forward kernel ridge regression as an approach for forecasting with many predictors that are related nonlinearly to the target variable. In kernel ridge regression, the observed predictor variables are mapped nonlinearly into a high-dimensional space, where estimation of the predictive regression model is based on a shrinkage estimator to avoid overfitting. We extend the kernel ridge regression methodology to enable its use for economic time-series forecasting, by including lags of the dependent variable or other individual variables as predictors, as is typically desired in macroeconomic and financial applications. Monte Carlo simulations as well as an empirical application to various key measures of real economic activity confirm that kernel ridge regression can produce more accurate forecasts than traditional linear methods for dealing with many predictors based on principal component regression.

Invited session: Index Models for Forecasting

Monday 27 June 4:25-5:25pm   Room: RB209

Chair: Andreas Graefe

Commentators: Geoff Allen, Robert Fildes, Robin Hogarth and Michael Lewis-Beck

Predicting the Effectiveness of Advertisements: A Validation Test of the Index Method

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We obtained predictions of recall scores for pairs of print advertisements for high-involvement consumer products. Each pair was the same with respect to product, brand, size of ad, and media placement, but differed with respect to headlines, copy, and illustration. Unaided individual judgments, the standard approach in this situation, were slightly better than guessing which ad had the better recall. This rate improved for randomly combined non-interacting groups of judges. The index method was hypothesized to be relevant for such an application in that there are many important variables that influence the effectiveness of advertisements, and extensive prior knowledge exists on the directional effects of these variables. Raters judged how well the ads adhered to 170 relevant evidence-based principles. Using unit weights across the principles, we calculated a 'persuasiveness index' for each rater, and compared that with the predictions obtained by unaided judgments. Using unit weights across the principles, we calculated a 'persuasiveness index' for each rater, and compared that with the predictions obtained by unaided judgments. Using equal weights, we averaged ratings for each of the principles across raters and the hit rate improved. A regression analysis was used to predict the differences in the recall rate of each ad from the differences in their index scores.

Who Should Be Nominated to Run in the 2012 Presidential Election?

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The state of election forecasting has progressed to the point where it is possible to develop highly accurate forecasts for major elections. However, one area that has received little attention is the use of forecasting as an aid to those involved with political campaigns. In the run-up to the presidential primaries, we will use the bio-index model to test the chances of potential nominees to defeat the Democratic candidate in the 2012 U.S. presidential election. This model uses the index method to incorporate 59 biographical variables (e.g., age, marital status, height, appearance) for making a conditional forecast of the incumbent's vote-share, depending on who is the opposing candidate. The bio-index method counts the number of variables for which each candidate rates favorably, and the forecast is that the candidate with the highest score would win the popular vote. The variables were selected based on received wisdom and findings from prior research. For example, several studies found candidates' perceived attractiveness or facial competence to be related to their chances of winning an election. The model is designed for long-term forecasts; thus, it can help political parties in deciding whom to nominate. It picked the correct winner for 27 of the 29 elections from 1896 to 2008. The forecasts from the bio-index model will be compared to forecasts from other methods such as polls and prediction markets.

Contributed Session: Forecasting Methods

Monday 27 June 4:25-5:25pm   Room: RB210

Chair: Everette S. Gardner

Bootstrap forecast of Multivariate VAR models

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In this paper we propose a new bootstrap procedure to obtain prediction regions in multivariate VAR models. The main advantage of the new procedure is that it avoids using the backward representation, so it is much simpler than previous procedures without losing the good performance of bootstrap prediction regions. Bootstrap prediction intervals are attractive because they incorporate the estimation uncertainty and do not rely on the particular assumptions on the error distribution being at the same time simple from a computational point of view. Furthermore, by avoiding a backward representation, the asymptotic validity of the procedure can be proved without relying on the Gaussian errors. Finally, the new procedure is attractive because can be implemented to obtain prediction regions in models without backward representation which could be of interest from the empirical point of view as, for example, models with MA components or GARCH disturbances. By comparing the finite sample performance of the proposed procedure with that of alternative bootstrap procedures based on the backward representation, we show that they are similar. Finally, we implement the procedure to obtain prediction regions of future inflation, unemployment and funds rate for the US quarterly series.

Independence Test in SURE-Autometrics Algorithm

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SURE-Autometrics is an extended Autometrics algorithm developed for model selection of multiple equations with contemporaneous correlation in disturbances. These type of model also known as seemingly unrelated regression equations (SURE) where the joint modelling is recommended to increase the efficiency in estimators. Thus, the algorithm employs feasible generalized least squares method of estimation instead of ordinary least squares.

However, the efficiency can be gained when the disturbances highly correlated and this situation is detected through independence test. There are many tests can be found in literature but our focus in this study is on Monte Carlo quasi-likelihood ratio (MC-QLR) test and multivariate independent (MI) test. Both tests are compared using two different experimental frameworks. First, we employed the tests only for the initial model and the final selected model. Second, we included the test along the process of selection. The results are evaluated using geometric root mean squares error (GRMSE).

Meta Learning using Multiple Forecast Errors - Automatic Model Selection of Exponential Smoothing

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In forecasting for supply chain management and logistics, companies are faced with the challenge to forecast a large number of time series with heterogeneous patterns automatically. The challenge of matching patterns of seasonality (i.e. none, additive or multiplicative) and / or trends (i.e. none, linear, damped or exponential) with a suitable forecasting model is known as individual model selection. Despite the empirical significance of the problem, no consensus exists on how to best select models even within the class of exponential smoothing. Recently, meta learning has been employed to model selection by training a second stage algorithm to learn the relationship between features of the time series and / or the candidate models (i.e. independent variables) and the performance of each model (i.e. dependent variables) on a subset of time series. The meta learner is then used to predict the performance of the competing models on unseen time series, and hence conducts model selection. Despite the wide range of possible input features for meta learning, prior research (see e.g. Wang et al., 2009, Lemke and Gabrys, 2010) considered only time series characteristics such as the length of the series, coefficient of variation, autocorrelation etc. as independent variables. While this follows in the established tradition of rule based forecasting (see e.g. Collopy and Armstrong, 1992), it has overlooked an important source of information for meta learning: the in- and out-of-sample forecasting errors themselves, commonly used in conventional statistical model selection. We assess the empirical accuracy of meta learning using forecasting errors for model selection of exponential smoothing methods. First, we compute 36 metrics of forecast deviation (e.g. MAE, MAPE, MSE), forecast bias (e.g. ME, MPE, MdE), and relative measures (e.g. GMRAE, PB, TU) for each base learner of Brown\'s, Holt's linear trend, Gardner\'s Damped trend and Holt-Winters trend-seasonal exponential smoothing. These serve as input features for a meta learner, which is trained to select between candidates. Our experiments assess the effect of using (1) only a single vs. multiple error measure, (2) measures of absolute error, forecast bias, or a combination of both, (3) in-sample vs. out of sample errors, and (4) errors from 1-step ahead vs. multiple step ahead forecasting horizons. Accuracy is evaluated on 111 empirical time series from NN3-Competition, across multiple time origins, and in comparison to established statistical benchmark methods. The results show promise to support forecasting model selection using multiple error measures, including forecasting bias.

Invited session: Density Forecast Combination

Monday 27 June 4:25-5:25pm   Room: RB211

Chair: Kenneth Wallis

Nowcasting U.S. GDP: A Density Combination Approach

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In this paper we use an expert combination framework to produce density nowcasts for U.S. GDP using a large dataset. The combined density nowcasts are updated several times during the quarter, to highlight the importance of new data releases. We propose to combine the model nowcasts in a two-step procedure. In the first step, we pre-group models into the following three model classes: VARs, leading indicator models and factor models. The nowcasts from each model within a model class are combined using the logarithmic score. This yields a single, combined predictive density nowcast for each of the three different model classes. An advantage of this approach is that it explicitly accounts for uncertainty about model specification and instabilities within each of the different model classes. In a second step, the three predictive densities are combined into a single density nowcast, again using the logarithmic score. We first show that the logarithmic score of the predictive densities for U.S. GDP increase monotonically as new information arrives during the quarter. Likewise, the root mean square error of the nowcasts is reduced. Further, the predictive densities from our combination approach are well-calibrated throughout the quarter, while this is not the case for all of the individual models and model classes. Finally, we show that there are gains in terms of improved forecast performance from our combination framework, compared to following a strategy of trying to pick the best model at each point in time. We get similar results when forecasting Norwegian Mainland-GDP.

Forecasting inflation with opinion pools and dependent models

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We examine the performance of inflation density forecasts produced from opinion pools. In addition to linear and logarithmic opinion pools, we also consider variants which account for the dependence between forecasts. In a real-time application to US inflation, we find considerable dependence between density forecasts produced from an autoregressive model and a Phillips curve based specification. Modelling this dependence using a copula opinion pool delivers both sharper and better calibrated density forecasts than either of the two marginals. It also outperforms more traditional linear or logarithmic pools of the two forecast densities. But the gains from accounting for dependence are small if the copula opinion pool is estimated recursively as opposed to using full-sample information. This is similar to the finding by Smith and Wallis (2009, Oxford Bulletin of Economics and Statistics) for point forecast combinations.

Combining Macroeconomic Models for Prediction

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We consider the properties of weighted linear combinations of prediction models, or linear pools, evaluated using the log predictive scoring rule. Although exactly one model has limiting posterior probability, an optimal linear combination typically includes several models with positive weights. We derive several interesting results: for example, a model with positive weight in a pool may have zero weight if some other models are deleted from that pool. The results are illustrated using different popular models in macroeconomics, such as a DSGE model, a dynamic factor model and a VAR. We also show how using Bayesian and frequentist estimation procedure might lead to different combination schemes.

FIN3

Contributed Session: Finance

Monday 27 June 4:25-5:25pm   Room: RB212

Chair: Nigel Meade

Evaluating Value at Risk and Expected Shortfall using Generalised Asymmetric Volatility Models

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Value at Risk (VaR) and Expected Shortfall (ES) are risk measures which accurate estimation influences portfolio selection strategies. Their calculation involves the estimation of returns' volatility. Stochastic volatility (SV) models have gained considerable attention when dealing time varying volatility. Volatility asymmetry, via the leverage effect hypothesis, is now expressed simultaneously with the skewness and the excess kurtosis hypothesis introducing generalised asymmetric SV models. By using real financial data series, the new models are compared to existing SV models for their forecasting performance in the accurate VaR and ES evaluation. Finally, model averaging strategies on generalised asymmetric SV models are also tested for their forecasting reliability in the VaR and ES evaluation in comparison to the single model alternatives. Results show some success in predicting the risk measures for various financial data series.

The Predictability of Stock Market Returns in South Africa: Parametric versus Nonparametric Methods

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This paper compares the forecasting performance of a sub-class of univariate parametric and nonparametric models in predicting stock market returns in South Africa. To account for conditional heteroskedasticity in stock returns data, the nonparametric model is generated by the conditional heteroskedastic nonlinear autoregressive (NAR) model, while the parametric model is produced by the generalised autoregressive conditional heteroskedastic in mean (GARCH-M) model. The results of the paper show that the NAR as a nonparametric model performs better than the GARCH-M model in short-term forecasting horizon, and this indicates the importance of a distribution-free model in predicting stock returns in South Africa.

Takeover Prediction Using Forecast Combinations

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The ability to identify likely takeover targets at an early stage could provide an investor with valuable information to profit from investing in potential target firms. In this paper we contribute to the takeover forecasting literature by suggesting the combination of probability forecasts as an alternative method to improve forecast accuracy in takeover prediction and to realize improved economic return in portfolios made up from predicted targets. Forecasts from several non-linear forecasting models, such as logistic and neural network models and combinations of them, are used to explore the methodology that better reduces the out-of-sample misclassification error. We draw two general conclusions from our results. First, the combination methods outperform the single models and should be used to improve the prediction accuracy of takeover targets. Second, we demonstrate that an investment in portfolios of the combined predicted targets results in significant abnormal returns being made by an investor in the order of up to four times the market benchmark return, and in a portfolio of manageable size.

JUD3

Contributed Session: Judgemental Forecasting

Monday 27 June 4:25-5:25pm   Room: RB213

Chair: Petr Dostál

Defining and Forecasting 'Success' in Wage-Bargaining Negotiations among Unions, Employers and Governments

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In this study, we present three different approaches in tackling the problem of Defining and Forecasting Success' in Wage-Bargaining Negotiations among Unions, Employers and Governments: a) an Economics approach where a behavioural model is sought to be built via combining ideas primarily from Game Theory, Rational Expectations theory and Asymmetrical Information theory , b) a Management science approach, where a 'black-box' engineering approach is adopted without developing any model or questing any causality, an exact solution is sought via the employment of groups of Experts (interaction groups and Delphi groups) and guided respectively (in a Structured Analogies fashion), and c) an Econometrics approach where through the extensive collection of past \'negotiations\' information and data, a \'white-box\' approach is adopted where a causal multivariate regression model is sought to be developed. This research is at its very early stages and conceptual models will be presented only, without any empirical evidence backing them up for the moment.

Effects of Trend Strength and Direction on Accuracy and Consistency in Judgmental Forecasting

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The direction and strength of the trend are two primary factors that influence the quality of judgmental forecasts. Aiming to extend existing knowledge in this context, the current study presented finance students with 20 actual FOREX series and asked them to generate one period ahead directional probabilistic forecasts and point forecasts for each series. Ten of the series were chosen to include moderate trend strength levels, while the other ten were chosen to include strong trend levels. At the same time, half of the series were the inverted forms of the other half so that there were equal instances of upward and downward trends. Additionally, one group of participants only generated forecasts, while another group also answered two questions regarding their perceptions about the strength and direction of trend present in each of the series under consideration. The results obtained indicate that performance on upward trends was superior to that on downward trends and performance on moderate trends was superior to that on strong trends. Furthermore, the group whose attention was drawn to the direction and strength of each trend with the additional questions performed better than their no –additional questions counterparts. The inverted nature of the trend direction manipulation also permitted the examination of consistency in forecasts. Some degree of consistency in predictions between the downward and upward trends was evident; but there was a tendency for subjects to perceive upward trends as being stronger than downward trends. These results are discussed in terms of previous research.

Judgmental Forecasting and Simulation

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The article deals with the build-up of a model for judgmental forecasting. The built up model is described, its inputs and outputs are explained and interpretation of its results are mentioned. The two dimensional partial differential equation of second order is used for the simulation. The possible usages are mentioned such as hospital, hotels, banks, warehouses, petrol station and restaurant competitive environment. The judgmental forecasting serves as a support of decision making processes to entrepreneurs, managers and investors.

TFR1

Contributed Session: Topics in Forecasting
Wednesday 27 June 4:25-5:25pm   Room: RB204

Chair: Gloria Gonzalez-Rivera, University of California, Riverside, United States

Forecasting in Uncertain Times

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Using monthly GDP forecasts produced by individual forecasters in the private and public sectors for about 30 advanced and emerging economies during 1989–2010, we explore how forecasters' behavior changes in periods of high uncertainty, particularly the turning points of business cycles and economic and financial crises. We confirm forecasters' tendency for groupthink behavior as well as smoothing and convergence of forecasts in response to new information. In periods of high uncertainty, herding (defined the tendency to anchor individual forecasts on the consensus forecast) tends to rise, while the degree of smoothing of forecasts in response to incoming data falls. The magnitude of these effects varies depending on the nature of uncertainty, the type of shock hitting the economy, and the level of its development. The effects are most pronounced in recessions and in currency crises rather than recoveries and banking crises; and in advanced economies rather than emerging economies. The effect of higher uncertainty on the degree of convergence over the forecast horizon is asymmetric in downturns and upturns.

Simulating planning scenarios for the Brazilian electrical sector with respect to sport events

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In the last decades, Brazil has experienced a great improvement in its economy. The monetary stability, the fiscal responsibility, the reduction of the social discrepancy and the fast economic growth are real evidences of the overall progress of the country. In this context of fast and emergent growth, the state of Rio de Janeiro, the second largest state of the country as far the GDP is concerned, is scheduled to receive important sport events in the forthcoming years, i.e., the Soccer World Cup in 2014 and the 2016 Olympic games. Such events demand a great deal of investments and a growth rate above the historical rate in various sectors of the economy. Aiming to evaluate the impacts of these events in the Brazilian energy matrix, this paper investigates the possible drawbacks that could affect the energy sector, as the supply of the inputs in this sector is not at all largely elastic and requires a structured and organized growth scheme in the years prior to the events. In order to carry out this analysis, a Vector a

Autoregressive Model (VAR, for short) was used to model jointly the monthly variation of residential consumers and the GDP. With the model estimated it was possible to implement "what if response" of consumer variation for several scenarios of the economy growth rate stated in terms of GDP.

K3

Plenary Session: Keynote Speech

Tuesday, 28 June, 8:15am-9:20am   Room: RB101

Chair: Kenneth Wallis, University of Warwick, United Kingdom

Forecasting when you suspect 'this time is different' - a typical day in the life of a macro economic forecaster

Edward Leamer

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Real macro-economic forecasting is a personal tug-of-war between extrapolative time series forecasts offered by the left side of the brain and the intuition that "this time is different" offered by the right side. The left-dominant forecasters are the number crunchers who offer forecasts that are either simple or elaborate versions of regression toward the mean. Left-dominant forecasters may become wealthy but they do not become famous. The famous forecasters are the right-dominant macro gurus who offer stories not numbers. Their lack of numbers allows these macro gurus to celebrate their successes while not being embarrassed by their errors. The best place to be is somewhere between the technical forecasters and the gurus, offering sophisticated access to the historical data and also wisdom regarding changes in the system that need to be accommodated to make the forecasts accurate and the stories interesting. What I will do in this paper is discuss a number of instances in which I was confronted with a "this time is different" hypothesis. Sometimes I went "right" and sometimes "left," sometimes successfully and sometimes not.

Edward Leamer is the Chauncey J. Medberry Professor of Management, Professor of Economics and Professor of Statistics at UCLA. He received a B.A. degree in mathematics from Princeton University and a Ph.D. degree in economics and an M.A. degree in mathematics from the University of Michigan. After serving as Assistant and Associate Professor at Harvard University he joined the University of California at Los Angeles in 1975 as Professor of Economics and served as Chair from 1983 to 1987. In 1990 he moved to the Anderson Graduate School of Management and was appointed to the Chauncey J. Medberry Chair. Professor Leamer is a Fellow of the American Academy of Arts and Sciences, and a Fellow of the Econometric Society. He is a Research Associate of the National Bureau of Economic Research and a visiting scholar at the International Monetary Fund and the Board of Governors of the Federal Reserve System. He is currently serving as the Director of the UCLA Anderson Forecast. Dr. Leamer has published over 100 articles and 4 books . This research has been supported by continuous grants for over 25 years from the National Science Foundation, the Sloan Foundation and the Russell Sage Foundation. His research papers in econometrics have been collected in Sturdy Econometrics, published in the Edward Elgar Series of Economists of the 20th Century. His research in international economics and econometric methodology has been discussed in a chapter written by Herman Leonard and Keith Maskus in New Horizons in Economic Thought: Appraisals of Leading Economists.

Featured Session

Tuesday, 28 June, 9:30am -10:30am   Room: RB209

Chair: Robert Fildes, Lancaster University, United Kingdom

Limits to the Forecastability of Climate Change and its Consequences

David Stainforth

Grantham Institute on Climate Change and the Environment, London School of Economics, United Kingdom

Anthropogenic climate change poses a serious and substantial threat to global society. We know this from basic physical understanding. Yet forecasting the detailed response of climate to increased atmospheric concentrations of greenhouse gases nevertheless presents fundamental scientific challenges. This is particularly true at regional and local scales on which information is often sought for adaptation activities. Such activities represent increasingly significant investments; they are likely to represent a significant fraction of the $100B/year "green fund" agreed as an aim for 2020 at the Cancun climate talks last December. Most statements about future climate are founded on the output of complex climate models. Similar models are used for weather forecasting on periods of days to months but climate forecasting is fundamentally different. It involves statements about the system's response on multi-decadal timeframes over which we expect feedbacks in slow processes to be of first order importance; processes such as changes in surface vegetation, snow cover, ocean circulation etc. Unlike weather forecasting there is therefore no possibility of confronting the forecasting system with multiple out-of-sample verifications i.e. no possibility of a cycle of confirmation and refinement. Given this extrapolatory nature of the problem, the underlying justification for trusting a climate forecast comes not from well understood statistics but from well understood physical processes. The climate models are often taken as representing these underlying processes. However, although the models are fantastic achievements of modern science they are significantly different from the real world; many processes are missing and/or significantly different from reality. The challenge in climate forecasting today is to extract decision relevant information from these models, and from climate science more generally. To do so requires a new paradigm which combines understanding from physics, statistics and nonlinear systems theory and leads to the communication of robust and relevant information to decision and policy makers throughout society.

David Stainforth is a physicist by training and has many years' experience of climate modelling. While a researcher at Oxford University, he co-founded and was chief scientist of the climateprediction.net project, the world's largest climate modelling experiment. David has been both a NERC Research Fellow and a Tyndall Research Fellow at Oxford University. Research interests: How we can extract robust and useful information about future climate, and climate related phenomena, from modelling experiments; Issues of how to design climate modelling experiments and how to link climate science to real-world decision making in such a way as to be of value to industry, policymakers and wider society.

FS4

Featured Session

Tuesday, 28 June, 9:30am -10:30am   Room: RB210

Chair: Paul Goodwin, University of Bath, United Kingdom

Election Forecasting: The Future

Michael Lewis-Beck

F. Wendell Miller Distinguished Professor of Political Science, University of Iowa, USA

Political forecasting has become a prosperous enterprise, election forecasting in particular. Of the three dominant approaches – models, markets, and polls – only the first concerns itself with model-building. The number of election forecasting models is growing, as theory develops and more democracies come under study. Increasingly, an election forecaster must ask – when should I change my model? This is the question I address.

Michael Lewis-Beck

Michael S. Lewis-Beck is F. Wendell Miller Distinguished Professor of Political Science at the University of Iowa. His interests are comparative elections, election forecasting, political economy, and quantitative methodology. Professor Lewis-Beck has authored or co-authored over 180 articles and books, including Economics and Elections, The American Voter Revisited, French Presidential Elections, Forecasting Elections, The French Voter, and Applied Regression. He has served as Editor of the American Journal of Political Science and is currently an Associate Editor of International Journal of Forecasting.

ICT3

Invited session: New Products and Innovation in ICT

Tuesday 28 June 9:30-10:30am   Room: RB204

Chair: James Alleman

Are forecasting innovations aligned or disconnected from modelling research? Experience from the ICT

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Research in forecasting methodologies for new products and services have been primarily focused on the post-launch phase of the innovation. The literature is rich and extensive. Forecast accuracy of new product launches have also been studied for some time. However, research on forecasting and associated risk measures for pre-launch stages of the innovation from idea to launch are much more difficult to identify. Understandably, there is a lack of 'hard data' and most of the information is kept proprietary within the organization. In this presentation, we would like to explore the modeling requirements for forecasting, accuracy measurement and risk assessment for the early stages of innovation evolution. We will specialize our discussion for the high-tech, mainly the ICT (Information Communication Technology).

What to Look for in a Good Forecast

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Evaluating forecasts, whether they are yours or others, requires a highly critical attitude and knowledge of basic forecasting principles. We provide a compendium of things to look for when judging a forecast, ranging from the mathematical to the psychological to common sense. We discuss an illustrative example of bad forecasting—namely forecasts of bandwidth growth in the late 1990s—that resulted in enormous negative economic consequences, when, tragically, good forecasts were in fact available. This was bad forecasting not just because it was wrong or because it caused a disaster, but also because it violated basic forecasting principles and was demonstrably wrong before the fact. We also review several experts view on how to judge a forecast. We conclude that, while forecasting is inherently uncertain, there is much that can be done to minimize the risk of getting it wrong.

The Effects of Media Ownership on Household Demand and Welfare

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This study examines the effects of media ownership structure on household demand and welfare. A differentiated product model is used to estimate demand for the local media environment, described by the offerings from newspapers, radio, television, the Internet and Smartphone. Results are used to show how much the representative U.S. household is willing to pay for different viewpoints in the reporting of information on news and current affairs, more information on community news and events, more information that reflects the interests of women and minorities, and for less advertising. Demand estimates are used to predict the expected household welfare from a change in media ownership rules that affect the market's provision of diversity and localism features. These calculations show that a increase in the number of independent and different media voices in the market would yield a net-benefit to households.

EBC3

Invited session: Multivariate Models for Business Cycle Analysis III

Tuesday 28 June 9:30-10:30am   Room: RB211

Chair: Timo Teräsvirta

Estimation of the Time-Varying Nairu in Times of Disinflation

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When estimating a time-varying Nairu (tv-Nairu), most of institutions rely on the methodology proposed by Gordon (1997) where this variable is estimated with the Kalman filter as a time-varying coefficient of an expectation-augmented Phillips curve. Laubach (2001) enriched this approach with bivariate models, which incorporate a trend-cycle decomposition of the unemployment rate. However, these models are not really convincing, because they do not really deliver a tv-Nairu, but a trend of unemployment. Indeed, the tv-Nairu is the long-run trend of the shifts of the Phillips curve, which combine the trend of unemployment and of inflation. In our paper, we propose a double-trend bivariate model, which incorporates simultaneously the trends of inflation and of unemployment. An expectation-augmented Phillips curve includes simultaneously the unemployment cycle and a time-varying constant. This tv-coefficient might be interpreted as a permanent disinflation shock, which is related to changes of the inflation trend. In this model, a combination of the unemployment trend and the disinflation shock produces a tv-Nairu. We compare this model with two benchmarks, a single-trend univariate model in the spirit of Gordon (1997) and a single-trend bivariate model in the spirit of Laubach (2001). We estimate the three models for the Euro area in the period 1972-2006. Empirical results show that this double-trend bivariate model enriches the diagnosis relative to other models. Moreover, the uncertainty around the estimate of the tv-Nairu is more correctly measured and is reduced in such an extended model.

A General to Specific Approach for Selecting the Best Business Cycle Indicator

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Combining economic time series with the aim of obtaining an indicator for business cycle analyses is an important issue for policy makers. In this area, econometric techniques usually rely on systems with either a small number of series, N, (VAR or VECM) or, at the other extreme, a very large N (factor models). In this paper we propose tools to select the relevant business cycle indicators in a \ medium\ N, a situation that is likely to be the most frequent in empirical works. An example is provided by our empirical application, in which we study jointly the short-run co-movements of 24 European countries for the period 1997Q1 to 2010Q3 (T=53). Although the limited sample size does not allow for the use of multivariate regression models, we show, under not too restrictive conditions, that parsimonious single-equation models can be used to split a set of N countries in three groups. The first group comprises countries that share a synchronous common cycle, while a non-synchronous common cycle is present among the countries of the second group. Finally, the third group collects countries that exhibit idiosyncratic cycles. The empirical findings suggest that most of the countries that we consider share a non-synchronous common cycle.

Nonlinear forecasting of macroeconomic variables using automated model selection techniques

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In this paper, the attention is focused on a well-defined class of flexible models, the so-called single hidden-layer feedforward neural network models. Neural networks or multilayer perceptrons are universal approximators that can arbitrarily accurately approximate any function satisfying rather mild regularity conditions. A major aim of our study is to see whether they, due to their flexibility, are as useful tools in economic forecasting as some previous studies have indicated. A problem with these multilayer perceptrons is how to specify their structure and estimate the parameters. Recently, White (2006) presented a solution that amounts to converting the specification and nonlinear estimation problem into a linear model selection and estimation problem. This leads to a model selection situation that is somewhat atypical, at least in time series econometrics, in which the number of variables may vastly exceed the number of observations. The second aim of this paper is to compare three methods for model selection capable of handling this situation. One is White's QuickNet, and the other two are the Marginal Bridge Estimator, well known to microeconometricians, and Autometrics, popular among time series econometricians. In this study we consider multiperiod forecasts. There are two main ways of generating them. One is to specify and estimate a single model and generate the forecasts recursively from it. It is also possible to build a separate model for each forecast horizon and use it for obtaining the forecasts for the horizon in question. The third aim of this paper is to compare the performance of these alternatives, when the set of available models mainly consists of linear autoregressive, neural network and nonparametric ones. Nonlinear models, such as the neural network model, sometimes generate unrealistic or 'insane' forecasts. This problem can at least partly be remedied by adjusting such forecasts by replacing them by more 'realistic' values. Our fourth aim is to consider this possibility, called filtering the forecasts, and see whether it can improve the accuracy of macroeconomic forecasts from neural network models estimated using automatic modelling techniques. We consider two different filters for the purpose. It is possible to test

linearity of the time series before any model selection and thus preclude nonlinear models when they seem superfluous. In theory this is not necessary if linear lags of the model to be forecast are included in the set of variables to select from in building the neural network model. Our aim is to find out whether or not such pre-screening improves the accuracy of the forecasts.

EBC4

Contributed Session: Economics and Business Cycles

Tuesday 28 June 9:30-10:30am   Room: RB212

Chair: Simeon Vosen

Base year revision of CPI in the conduct of monetary policy

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We evaluate the validity of inflation index using the real-rime data of price index. Many central banks focus on Consumer price index (CPI) as benchmark variable for price stability. CPI has high reliability and availability because revision of CPI is very few. Before about 12 months of the base year revision, the reliability of CPI has reduced gradually. We can find that the difference between old and new base year becomes larger when we have estimated the several base year data. This fact means we cannot regard CPI as the accurate inflation measures, especially in zero inflation situations, on about 1 year ago of the base year revision. In fact, when the base year revised from 2000 to 2005 base year on July 2006, 2000 base year data was higher than 2005 year about 0.3% on average. As Bank of Japan recognized the price stability from deflation, the Bank of Japan decided to change the operating target of money market operations from the outstanding balance of current accounts at the Bank to the uncollateralized overnight call rate on March 2006. Quantitative easing policy was canceled. But we find the CPI was still minus level. On the other hand, the personal consumption expenditure (PCE) deflator has revised frequently. As PCE is near accurate, many revise is insignificant. When we estimate the statistical property of revision on PCE using real-time data, we find the revision was caused by the statistical error. This means we cannot forecast the future PCE. But CPI and PCE move in the same way, and there is a time lag in the base year revision between CPI and PCE. We use the PCE as complement to CPI before CPI base year revision.

Forecasting Macroeconomic Variables with Qualitative Survey Data

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This paper assesses the forecast ability of Norges Bank's regional survey for inflation, Gross Domestic Product growth and the unemployment rate in Norway. We propose several factor models based on regional and sectoral qualitative information given by the survey, and an averaging approach to mitigate the model uncertainty. The analysis identifies which information extracted from the ten sectors and the seven regions performs particularly well at forecasting different variables and horizons. Results show that several factor models beat an autoregressive benchmark in forecasting inflation and unemployment rate, but only factor models estimated using full datasets from a set of regions and sectors systematically outperform the benchmark for Gross Domestic Product growth. Forecast combinations based on past performance provide more accurate forecasts than the benchmark in several cases, but they are never superior to the best factor model.

A Monthly Consumption Indicator for Germany Based on Internet Search Query Data

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This paper introduces a new monthly indicator for private consumption in Germany, which is constructed using data on Internet search behaviour provided by Google Trends. Due to the increasing popularity of the Internet, it is quite certain that a substantial share of people use the Internet to collect information on goods they intend to buy. Reflecting the research and selection phase of the consumption process, data on web search queries as provided by Google Trends might be even closer related to actual spending decisions of private households than data on consumer sentiment. To employ the Google data for consumption forecasts, we extract common unobserved factors from time series of web search categories of the Google Trends application Insights for Search. The Google-Indicator then reflects nowcasts of real monthly consumption that are made based on these factors. The new indicator's usefulness to economic forecasters is assessed by testing to what extent the Google factors improve an iterated autoregressive model compared to common survey-based sentiment indicators. Any new indicator for private consumption should also be examined with regard to its ability to improve forecasting models that already contain other macroeconomic variables. We therefore repeat the exercise using a model that includes several other macroeconomic variables related to consumer spending. To get a realistic impression of the indicators' usefulness in actual forecasting, real-time data are used in all experiments. It turned out that in all out-of-sample experiments the Google indicator outperformed the survey-based indicators. Additionally, the new indicator also provided substantial predictive information on consumption beyond that already captured in other macroeconomic variables.

SUP2

Contributed Session: Forecasting Practice in the Supply Chain

Tuesday 28 June 9:30-10:30am   Room: RB206

Chair: Charlotte Brown

Complex Model of Forecasting Performance - A Story of Two Different Distribution Systems

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Forecasting function in business environment is subject to many factors, which cannot be limited only to methodical or structural questions. Recent theory development as well as competitive practice implies that complex approach is needed. Presented research expands this idea in demand forecasting (retail chains and financial distribution) and focuses on complex model of forecasting management system, with the ambition to include and analyze every significant factor of forecasting performance. Log linear analysis is used as a primary method and results imply several interesting findings, partially controversial to some theoretical mainstream assumptions, mainly regarding the system and individual (forecaster) importance.

Forecasting Practices under collaborative Supply Chain Partnerships: Survey-based Evidence on Information-Sharing and Forecasting Methods

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The benefits of collaborative supply chain partnerships such as CPFR, VMI and information-sharing between retailers and suppliers are widely documented through case-based and modelling research. However, despite the importance of forecast accuracy on supply chain performance, studies have not described in detail the data conditions facing manufacturers under different forms of collaboration and how they subsequently use this information to forecast. This research tests the hypothesis that the different data conditions arising from collaboration lead to the use of different forecasting methods. The sharing of Point-of-sale (POS) data, retailer forecasts and promotional calendars offers voluminous information of potential value, however the types of model required to integrate it are different to those traditionally used. This can lead to valuable information being stored in

a data warehouse and never used. This study uses evidence from the field collected through a large-scale survey of forecasters within consumer goods manufacturers to address questions regarding the prevalence, format and usage of information shared by retailers through collaborative partnerships. The web-based survey was pre-tested by both academics and practitioners for relevance and clarity and the refined instrument was distributed to the full sample. Analysis is conducted to determine the different types of information shared in specific retailer-supplier dyads. For each data type (store-level sales, retailer distribution centre withdrawals, stocks, promotional information, retailer forecasts), the exchange frequency, data periodicity, exchange method and information accuracy are measured.

From this analysis we present typical data conditions for the different collaboration types and determine whether the shared information is integrated into the forecasting process judgementally or through modelling. Additionally, we test the hypotheses that factors such as collaborative maturity and forecasting capabilities influence the level of usage of the data, and also identify which information is deemed most important to improving forecasting accuracy.

Rationality and Foolishness: Alternative forecasting systems in a manufacturing firm

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The literature on forecasting suggests that forecasters in firms will employ mathematical techniques in order to predict the future demand for a firm's goods and services as these produce good forecasting outputs. In practice, however, many forecasters within organizations eschew statistical methods of forecasting and depend instead on human expertise. This resistance to the idealized model of forecasting practice has often been understood in the literature as a failure of rationality in firms. This paper provides a social and political analysis of forecasting in a case study firm, and examines alternative rationalities present in the firm that legitimate what appears to the forecasting literature as foolish practices. The case study organization, a large manufacturing firm, undertook a process of reform of the forecasting process during the course of the study. This paper explores how resistance to this reform was shaped by the local equilibrium that had been reached between rationalities in the firm.

DEM1

Contributed Session: Demographics

Tuesday 28 June 11:00am-12:30pm   Room: RB204

Chair: Victor Guerrero

Probabilistic population forecasting for sub-national regions: a case study of South East Queensland

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Over the last two decades significant progress has been made in the development of probabilistic population forecasting methods, and many applications to countries and global regions are now in evidence. Unfortunately little interest has been shown in the extension of these methods to sub-national areas (and other disaggregations of national populations). Given that forecast error is inversely related to population size, coupled with the fact that much planning occurs at the local and regional scale, the need to quantify forecast uncertainty for sub-national regions is arguably even greater than at the national scale. In addition to uncertainty surrounding fertility, mortality and international migration, sub-national projections are compromised by the volatile nature, and hence the limited predictability, of internal migration. This paper presents a regional probabilistic projection for the rapidly growing region of South East Queensland, a metropolitan region of about 3 million people in eastern Australia. A bi-regional framework is adopted consisting of the region of interest and the rest of the country; predictive intervals for fertility, mortality and migration are formulated on the basis of time series models, past errors and expert judgement. The results demonstrate the considerable extent of forecast uncertainty for the region, and reveal how the official high-low projection range provides a misleading, and rather narrow, indication of uncertainty. The paper concludes by discussing how probabilistic forecasts might be applied in metropolitan regional planning.

Prognosis of tertiary education development in the Czech Republic and its economic aspects

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Relationship between higher education level and business cycle is well known from several studies. The Czech Republic is now in the middle of transition period of tertiary education. After the period with a very low ratio of tertiary educated people in the population, in 2000s tertiary education was petting more accessible for population. It means, the ratio of tertiary educated population has increased. Also the economic change is obvious – the transition from centrally-planned economy to free market economy is almost over. The aim of the paper has two parts, prediction of number of students/graduates and prediction of economic aspects of this development. At the first part, we try to predict the ratio of tertiary educated people in population. However, forecasts of numbers of students graduated from universities are influenced by demographic projections, which is the easier issue, and on the changes in education policy. For forecasting number of students and/or graduates, we need not just demographic data and forecasts, but also we have to estimate the tertiary education system changes which are influenced by intentions of the ministry of education. The second part of the paper is focused on impact of changes in numbers of graduates and in educational structure of population on the economy. Demographic changes and changes in education policy will influence the economic development and quantification of these changes is a subject of the second part of our paper.

Prognosing the development of the human capital of the Czech Republic

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The output of classical population projections is the sex and age structure of the population in each year of the projected period. These forecasts provide no information e.g. about the productive capacity of individuals, the qualitative side of human capital. A simple (very imperfect) indicator of human capital is education level. The computation of the population projection by sex, age and education level of each person is based on the classical component projection method with simplified model of migration (only immigration at the level of net migration is assumed, emigration is supposed to be zero). The computation is carried out for each sex separately. Only four basic groups of education level are distinguished: primary education (including no education or incomplete education), secondary lower education (without the school leaving exam), secondary higher education (finished with the school leaving exam) and tertiary education. Computation of the projection is based on the initial population structure (not only by sex and age but also by education level) and the data describing the expected development of fertility, mortality and migration and also the data of expected numbers of graduates of particular types of schools. Two variants of the future development of mortality, fertility and migration have been taken into account. First variant is a slightly modified medium variant of the population prognosis computed by the Czech Statistical Office in 2009. The second variant assumes that the fertility of the Czech females will follow the fertility of the Netherlands' females. The development of the education level in both variants is very similar. The proportion of people with tertiary education will grow very rapid both for males and females. On the other hand the proportion of people with

primary education will markedly drop. At the same time the gap between males and females in the education level will diminish.

Non-parametric graduation of mortality rates by segments of the age range

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A method to estimate smooth trends in mortality rates with the age range partitioned into segments is proposed. The method combines the goodness of fit and smoothness of the non-parametric approach for the different user-defined segments, thus allowing to control the estimated mortality rate smoothness in each segment. The two main objectives of this proposal are: (i) to allow the comparison of mortality rate trends with the same percentage of smoothness and (ii) to enable estimation of the mortality trend over a segment of interest with higher or lower degree of smoothness than over other segments. Some smoothness indexes and their properties are provided with the aim of helping the analyst to make more informed decisions when applying data smoothing in practice, particularly to select the smoothing constants involved appropriately. Some illustrative examples with real data are presented in order to verify that the proposed methodology yields satisfactory results.

Contributed Session: Finance

Tuesday 28 June 11:00am-12:30pm   Room: RB205

Chair: Alain Kabundi

A perspective on predicting the stock returns and idiosyncratic volatility relationship

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In finance literature, the relationship between stock returns and idiosyncratic volatility has been referred to as a puzzle by many researchers. There have been numerous research papers published in the past two decades that attempt to explain this relationship. Some researchers find this relationship to be positive while others quote it as negative. Some suspect that the relationship may be non-linear. Most of these investigations have addressed this issue by forming portfolios on one or more explanatory variables and applying least squares method to capture the relationship using a variety of explanatory variables in numerous aggregation settings involving time series and/or cross sectional models. The method of least squares explains the conditional distribution of returns given a vector of explanatory variables at the mean level. Thus, the predictions of researchers about the stock returns and idiosyncratic volatility relationship apply only at the mean level. In this paper, we present a different perspective on predicting returns and idiosyncratic volatility relationship by applying the quantile regression method in two different settings of panel data structure and estimating the conditional distribution of returns at various quantiles of interest. The method allows the marginal effects of regressors to change for stocks at different quantiles in the conditional distribution, and facilitates parameter heterogeneity across different types of stock returns. We also fit a least squares model for bench marking purposes. We observe that the stock returns and idiosyncratic volatility relationship is indeed dynamic, of parabolic nature and depends on the quantile of the conditional distribution being estimated. Our findings give further insights towards unravelling the idiosyncratic volatility-return puzzle.

Forecasting the term structure of the Euro Market using Principal Component Analysis

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We forecast the monthly Euro Interest Rate Swap Curve with an autoregressive principal component model. We compare its predictability accuracy against the Diebold and Li's dynamic Nelson Siegel, the auto-regressive direct regression of the yield levels and the random walk model. After a robust set of specifications and regression windows, we conclude that our proposed model achieve forecasts that significantly outperform the competitor models, mainly for short run horizons.

Volatility Spillovers across South African Asset Classes during Financial Crises

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This paper studies domestic volatility transmission in an emerging economy. Daily volatility spillover indices, relating to South African (SA) currencies, bonds and equities, are estimated using variance decompositions from a generalised vector autoregressive (GVAR) model (Pesaran and Shin 1998). The results suggest substantial time-variation in volatility linkages between October 1996 and June 2010. Typically, large increases in volatility spillovers coincide with domestic and foreign financial crises. Equities are the most important source of volatility spillovers to other asset classes. However, following the 2001 currency crisis, and up until mid-2006, currencies temporarily dominate volatility transmission. Bonds are a consistent net receiver of volatility spillovers. In comparison to similar research focussing on the United States (Diebold and Yilmaz 2010), volatility linkages between SA asset classes are relatively strong.

Time-Varying Volatility Co-Movement in World Equity Markets: A Dynamic Factor Analysis

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This paper measures volatility co-movement in world equity markets between 1994 and 2008. A large-panel factor model (FM) is used to extract common determinants of volatility across countries. The panel consists of monthly volatility proxies for composite and sector-specific indices from 18 developed and 28 emerging markets. We delve inside the black box of the FM, thus identifying world volatility as being dependent on different combinations of fundamental and financial variables. Time-varying variance shares of the common factors map differences in volatility co-movement across markets and over time. The results indicate that developed markets in Europe are generally most closely integrated with world volatility. Apart from Hong Kong, Brazil, and Thailand, emerging markets are characterised by lower degrees of volatility co-movement than developed markets. Explanatory power of world factors on domestic volatilities peak in the wake of global financial crises in East Asia (1998) and the United States (2007-8).

Predicting Credit Risk in Long Panels of Loan Portfolios

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Credit risk analysis is of great importance for banks profitability and solvability. Depending on the type of bank, the complexity of its activities and the diversification of its portfolio, minimum capital requirements associated with credit risk usually account for the most part of the total minimum capital requirements that banks are required to hold. Using a unique quarterly data set of portfolios of non financial firms' loans and bank balance sheet data covering a period from 1995 to 2010, in this paper we estimate measures of credit default based on panel data approaches. We assess the in- and out-of-sample forecasting performance of autoregressive panel data models and dynamic panel data models with exogenous determinants. Of particular interest in the latter class, are models which take into consideration business cycle properties in order to evaluate aggregate measures of default in loans. These results will be of considerable importance given the decisions banks have to make under the Bank of International Settlements recommendations. Capital that banks are currently required to hold must reflect the risk of each specific exposure. They are dependent on a set of risk drivers (probability of default, the loss given default and the exposure at default) that characterize the credit risk of each exposure and can be estimated by banks. It is believed that capital requirements are pro-cyclical, as in the downturn of the cycle the risk drivers deteriorate and capital requirements increase. Although capital requirements apparently contribute for an enhancement of financial stability, they may affect the lending behavior of banks and therefore the economic activity. In this context, understanding the relationship between credit risk and economic activity is of extreme importance during the different phases of the economic cycle.

EVA2

Invited session: Prediction Distributions

Tuesday 28 June 11:00am-12:30pm   Room: RB206

Chair: Keith Ord
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Poisson Mixture Models for Call Centre Arrival Rate Density Forecasting

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Analytical call centre staffing models tend to assume that call volumes are Poisson distributed. The uncertainty in arrival rates has prompted volumes to be modelled using a Poisson mixture with a convenient distributional assumption for the rate. We present an exponential smoothing Poisson mixture model with gamma distributed arrival rate. This is a seasonal count data model designed to model intraday data. As an alternative to this fully parametric model, we also develop a Poisson mixture model that directly estimates individual quantiles of the rate distribution. This is enabled through the use of an asymmetric Laplace mixing distribution. The quantile estimates can be used to construct an arrival rate density forecast, or plugged into the Erlang formula to give a stochastic guarantee for the service level. We evaluate the models using real and simulated data.

Prediction distributions and the Forecasting Competition on Transportation data

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The most recent forecasting competition run by Michele Hibon employed 368 transportation-related data sets, which encompassed yearly, quarterly, monthly, daily and hourly series. The preliminary set of results studied the accuracy of the forecasts given by the competitors, based upon the time series characteristics of the data. Some of the competitors provided 95% Confidence Intervals for their forecasts. In this study we do an empirical investigation of the uncertainty of their forecasts by evaluating the percentage of observations outside the confidence intervals. We compared these results to that postulated theoretically.

Prediction distributions in inventory control

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Once prediction distributions of have been obtained, they must then be used in a decision-making process. This paper will explore a simple simulation approach for integrating prediction distributions of demand from exponential smoothing with inventory decisions. Particular emphasis will be placed on the fact that exponential smoothing allows for the uncertainty induced by structural change in markets and that this needs to be factored into decisions concerning the amount of safety stock to carry. Examples will be presented for demands with normal and negative binomial distributions.

For special interest group: prediction distributions

Prediction distributions for intermittent demands via simple exponential smoothing

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Inventory planning often requires the generation of forecasts over several time periods. Decisions about safety stocks then require knowledge of the distribution of the total demand over this time frame. We first develop analytical results for this distribution for products with low volume intermittent demand and evaluate different distributions using series that describe monthly demands for automobile parts. These analytical results are follow conventional practice in that the dynamic nature of demand is not taken into account. We then provide simulation results to measure the potential for improvement when changes in demand are modeled using a counts-based version of simple exponential smoothing.

FM3

Contributed Session: Forecasting Methods

Tuesday 28 June 11:00am-12:30pm   Room: RB207

Chair: Jennifer Castle

Issues in Univariate Forecasting

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As we know, forecasting involve uncertainty. Therefore, in univariate forecasting, several methods need to be executed on one data set in order to produce accurate forecast. The end users usually have difficulties or issues in completing the forecasting exercise when it involves tacit knowledge (or judgement). This study presented brief reviews on issues face by end users in univariate forecasting process. Based on our own experienced trying to automate the process leads us to the following issues; identification of time series components, partition of the data, issues in forecasting techniques, selecting error measures and determine forecast performance. Further research on these issues can provide guidelines especially to end users. Perhaps by automating the process will help them gain higher forecast accuracy and lead to better decision making.

Once Again: Classification of Forecasting Methods

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Since Erich Jantsch named more than 350 variants of forecasting methods in 1973, it has been popular to classify the techniques. However, we still find in most textbooks the classic division into quantitative vs. judgemental (objective vs. subjective, etc.) forecasting. Here we present a classification based on the crosstabulation of two essential matters: data available and goal of forecasting. The latter is derived from the general philosophical interests of knowledge (technical, understanding, critical). In addition, the applicability of single techniques for different forecasting purposes is evaluated.

Forecasting by factors, by variables or both?

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Is it better to forecast with factors, variables or both? We consider this issue in a setting where multiple breaks occur, modelling in-sample by using impulse indicator saturation (IIS) in the forecasting models. We analytically assess the implications of structural breaks for factor models, where the breaks could occur in the factor weights, the coefficients on the factors, or location shifts in the forecasting model. We forecast US GDP growth and inflation over 1-, 4- and 8-step horizons, with 109 factors, assessing selection on forecast performance rather than parameter estimates. Selecting principal components (PCs), or variables and PCs, results in similar forecasts, but selecting over variables only beats selecting over only PCs. Selecting over variables first then augmenting by selecting over PCs calculated from the omitted variables provides an alternative set of forecasts.

Modelling Periodic Autoregressive Structures using Bootstrap

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Regarding electrical energy generation, Brazil has approximately 90% of its energy supplied by hydroelectric plants. One of the main characteristics of the generation systems that have hydraulic predominance is the strong dependence of the hydrological regimes. In this context, the periodic autoregressive model, a particular structure of the Box & Jenkins family, denoted by PAR(p), is employed to model the series of hydrological streamflow used for estimating the operational costs of the Brazilian hydro-thermal optimal dispatch. Recently, some aspects of this approach began to be studied and several researches on this topic are being developed. This work is focused on the identification phase of the order p of the PAR (p), essential to the correct definition of the model structure, as well as to generate synthetic scenarios to be used in the optimization procedure. Nowadays, the identification is based on evaluating the significance of the estimated partial autocorrelation coefficients function (PACF), based on the asymptotic result of Quenouille. The first purpose of this study was on the application of a computer-intensive technique, called Bootstrap, to estimate the real statistical significance of such estimates. The second goal of this study was the use of the Bootstrap technique in order to generate synthetic scenarios. The current methodology uses an approach for noise generation through a three parameters Lognormal distribution. Such approach seems to cause an undesirable non-linearity in the model. In this work, the PAR (p) resulted residuals were used during the

scenarios generation. The results showed that the Bootstrap led to the identification of lower orders models, in comparison with the traditional approach, in almost all cases. In addition, the scenarios retained the statistical characteristics of the original series. The obtained results were quite satisfactory, corroborating some points raised in previous studies about the traditional approach.

Applying James-Stein Shrinkage Method to Multi-item Short-term Forecasting

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Since the demand of many products exhibits a seasonal pattern, accurate seasonal forecasting at the Stock-Keeping Unit (SKU) level plays an important role. The common approaches for seasonal forecasting are: Individual Seasonal Indices (ISI) method, Group Seasonal Indices (GSI) method and Shrinkage Seasonal Indices (SSI) method. Miller and Williams (2003) attempted to improve the forecasting accuracy by shrinking the ISI towards one for multiplicative seasonality, which focused on the application of the SSI to individual item. Bunn and Vassilpoulos (1999) applied shrinkage seasonal indices (SSI) estimator - James-Stein estimator to shrink the ISI towards GSI in multi-item forecasting, which utilised information from different items in a group. However, theoretical understanding of how to apply James-Stein estimator in seasonal demand has been lacking. In this paper, we conduct a theoretical exploration on how to apply James-Stein Shrinkage method to seasonal forecasting in a multi-item setting. And a simulation experiment is carried out to compare our method with other shrinkage methods.

CLI2

Invited session: Climate Predictions

Tuesday 28 June 11:00am-12:30pm   Room: RB209

Chair: Robert Fildes

What (if anything) can econometric forecasters learn from meteorologists (and vice versa)?

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Meteorologists view the earth's climate as a chaotic system, that is, nonlinear, deterministic, with sensitivity to initial conditions (a necessary but not sufficient condition for a chaotic system). They model it as a set of differential equations that are approximated by simulation at high frequency. Substantial computing power is essential. Measurement error imposes stochastic elements and makes initial conditions hard to specify. Consequently, great efforts are made to acquire, standardize and create data. Deterministic models are re-run by perturbing initial conditions. Ability to forecast at more distant horizons, or forecaster skill, is limited by the chaotic structure. Econometricians typically assume that economic systems are stochastic and, if nonlinear, can be sufficiently approximated by linear-in-parameters equations. While recognizing that data are often less than ideal, they generally ignore measurement problems. Properties of the system (though not parameter values) are assumed unchanged regardless of the frequency of available data. Randomness in coefficients encourages estimation of simpler systems so that great computing power is unneeded. The system has structural breaks and when they are better understood forecasts at distant horizons will improve. These stylized descriptions of two modeling approaches raise a number of questions. Are economic and climate systems fundamentally different? Is economic forecasting at a stage where weather forecasting was several decades ago? Should econometrics adopt some of the practices of meteorologists (and vice versa)? The paper attempts to identify the common features and fundamental disagreements of these two distinct approaches to modeling.

Climate Change Forecasting: How to Interpret Multi-Model Climate Ensembles

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The last thirty years has seen the development of twenty or so complex climate models. These represent the physical processes within the atmosphere, oceans and land surface and are the basis for most statements about future climate on regional and local scales. The last decade has seen a research focus on understanding the epistemic uncertainty related to the formulation of these models. As a result there have been a number of experiments to compare how they behave under similar boundary conditions and also to systematically explore the uncertainty resulting from

uncertain parameter values – so called perturbed physics ensembles. These ensembles provide a vast amount of valuable information regarding the diversity in model behaviour but how should they be interpreted in terms of the likelihood of real world response? There are a number of key challenges. First is the lack of independence between models. All models share approaches and sometimes code; they cannot be treated as independent samples of the domain of all possible models. How do we handle this dependence? Can it be quantified? How does it influence our statistical interpretation of the ensemble? Second is the quantification of the relationship between the model and reality. At what scales do we demand consistency? At what scales do we find consistency? Third is the risk of in-sample analysis. It is often impossible to repeat climate model ensemble experiments to derive new out-of-sample comparable data, yet the interesting behaviour to a physicist is often the extreme behaviour. The physical analysis can therefore be in conflict with the statistical analysis and lead to a bias in the resulting distributions. How can this be addressed? And finally, how do we extract real world meaning from the statistical behaviour across different model formulations?

Time Series Analysis for Korean Climate Change

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Several studies for climate change have shown that it will have a wide range of impacts on not only environments around our lives but also business and economic activities. A well-established time series analysis for climate change will encourage countries or firms to resolve their problems associated with unusually high temperature or a great deal of precipitation. However, most previous studies simply applied univariate statistical models or tests to historical climate data. This study suggests a bivariate time series model that deals with a relationship between temperature and amount of precipitation as well as time series structure of each. The data sets consist of monthly temperature means and monthly precipitation amounts from Korean Meteorological Administration (KMA). The proposed model is a parsimonious and cost-effective model that allows governments or managers to make decisions quickly related to climate change.

The role of decadal forecasting exercises in the validation of global circulation simulation models

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This paper first considers the validation of long term climate global circulation models as used by the IPCC in their forecasts of global warming, in particular their application to decadal forecasting. We present an appraisal of various extrapolative time series benchmarks forecasts of annual average temperature, both global and local. Methods

include non-linear univariate neural nets and benchmark smoothing models. Nonlinear multivariate models relating emissions and concentration to globally averaged atmospheric temperature are also considered. These models are compared for their accuracy against 10-year ahead forecasts produced from a global circulation model. By examining forecast encompassing tests it is shown that the global circulation model is mis-specified and its forecasts can be improved on by including forecasts from the time series models into the GCM. 20-year ahead forecasts are improved by including information on CO2 emissions but the addition of the theoretically more relevant variable, concentration, adds nothing. Finally, the implications for decadal forecasting in the IPCC 5th Assessment report are considered.

EVA3

Contributed Session: Evaluation

Tuesday 28 June 11:00am-12:30pm   Room: RB210

Chair: Robert Kunst

Identifying and Explaining the Number of Regimes Driving Asset Returns

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Investors or academics have the feeling that financial markets are driven by two regimes. Bull markets would be characterized by high returns and low volatility whereas bear markets would display low returns coupled with high volatility. Modeling the dynamics of different asset classes (stocks, bonds, commodities and currencies) with a Markov-Switching model and using a density-based test, we reject the hypothesis that two regimes are enough to capture asset returns' evolutions. Once the accuracy of our test methodology has been assessed through Monte Carlo experiments, our empirical results point out that between three and five regimes are required to capture the features of each asset's distribution. We test the stability and the robustness of this result by running a stability test over the 2008 crisis. A probit multinomial regression highlights that the underlying number of regimes is partially explained by the absolute average yearly risk premium and by distributional characteristics of the returns such as the kurtosis.

Reality Checks and Nested Forecast Model Comparisons

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This paper develops a novel and effective bootstrap method for simulating asymptotic critical values for tests of equal forecast accuracy and encompassing among many nested models. The bootstrap, which combines elements of

fixed regressor and wild bootstrap methods, is simple to use. We first derive the asymptotic distributions of tests of equal forecast accuracy and encompassing applied to forecasts from multiple models that nest the benchmark model – that is, reality check tests applied to nested models. We then prove the validity of the bootstrap for these tests. Monte Carlo experiments indicate that our proposed bootstrap has better finite-sample size and power than other methods designed for comparison of non-nested models. We conclude with empirical applications to multiple-model forecasts of commodity prices and GDP growth.

Forecasting Model Validation

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Forecasting models play a crucial role in many decision-making areas. Many tools have been developed for model selection and validation (on available data) but only few exist for answering the question whether the model under the test is still valid for the new observations. Especially when one looks for a quick answer after a small number of extra observations have become available. In this paper we analyze the model, which has already been selected, and examine whether its predictive ability is still good enough or the model needs to be reestimated. The proposed prediction capability procedure is based on nonparametric density estimation of the expected realizations from the examined model and on an approximated p value. The uniqueness of this procedure is that it provides guidelines after relatively low number of new (true) realizations. The procedure's ability to quickly recognize a change in the `reality\' is demonstrated on the AR(1) and the linear models. We have examined changes in the error variance and in the AR coefficient in the AR(1) model. In the linear model we have examined changes in the error variance and in the error distribution and the addition of economic cycle term. Although these are very simple models they are very frequently used in practice and the examined changes occur frequently. We find that the procedure has high power and a reasonably small size to recognize the changes in the data generation process after 10 to 20 new observations, depending on the type and the extent of the change as well as on the required confidence level.

On the usefulness of the Diebold-Mariano test in the selection of prediction models: Some Monte Carlo results

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In evaluating prediction models, many researchers flank comparative ex-ante prediction experiments by significance tests on accuracy improvement, such as the Diebold-Mariano test. We argue that basing the choice of prediction models on such significance tests is problematic, as this practice may favor the null model, usually a simple benchmark. We explore the validity of this argument by extensive Monte Carlo simulations with linear (ARMA) and nonlinear (SETAR) generating processes. For many parameter constellations, we find that utilization of additional significance tests in selecting the forecasting model fails to improve predictive accuracy.

EBC5

Invited session: Multivariate Models for Business Cycle Analysis II

Tuesday 28 June 11:00am-12:30pm   Room: RB211

Chair: Simon Van Norden

Real Time Trend Extraction and Seasonal Adjustment: a Generalized Direct Filter Approach

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We propose a new generalized estimation criterion which addresses the particular structure of the real-time signal extraction problem `directly'. The criterion replicates model-based performances as well as the original Direct Filter Approach (DFA) perfectly. It outclasses the DFA in numerical terms and it outperforms the linear approximation I-DFA in statistical terms. In particular, the new criterion is able to disentangle amplitude and time-shift effects/artifacts of real-time filters perfectly. A series of applications based on the European Industrial Production Index illustrate the scope of the resulting estimation paradigm.

On the usefulness of financial variables realized volatility for forecasting macro cycles turning points

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This paper is aimed at analysis of potential real-time macro cycles turning points forecasting effectiveness improvement with introduction of financial data. In contrary to studies where basic time series from financial markets such as stock exchange returns or foreign exchange rates' quotations are directly introduced into procedures of macro cycles turning points forecasting, this survey is focused on the determination and verification of a set of links between cyclical pattern of financial markets variation measures embodied with (set of) realized volatility estimator(s) defined in the series of Andersen, Bollerslev, Diebold and Labys (2000, 2001, 2003) papers and real macroeconomic time series. Usefulness of realized volatility measures of financial market variables for business cycle dating will be checked in real-time exercise (based on Eurostat vintage database) performed on vintages from last four-years span of time embracing the period of Great Depression of 2009-2010. Empirical part of the research will be performed for US economy, three big EMU countries France,Germany, Italy and UK. Two multivariate

dating algorithms will be used for calling the business cycles turning points – a non-parametric procedure of Harding and Pagan (2002) and parametric method of multivariate Markov Switching Dynamic Factor Model (MS-DFM) described by Chauvet (1998) and Chauvet and Hamilton (2004). Results of research performed on US data will be compared with official turning points dates published by NBER, in case of European countries analysis of Eurocoin leading index released by CEPR will be used as a benchmark. Apart from real-time macro cycle turning points forecasting exercise this paper will also verify known and uncover new channels of financial shocks transmission to real economy and worldwide financial turmoil spillover effects observed after Lehman fall in 2008. In this field adequacy of the hypotheses linking financial and real sectors described in the paper of Bernanke (1993) and articles of Bernanke, Gertler and Gilchrist (1996, 1999) will be verified.

Modeling Multivariate Data Revisions

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Although many official statistics produced by statistical agencies suffer from revisions, data revisions are typically studied in isolation ignoring information in other time series. This paper extends the Jacobs and van Norden (2010) modeling framework to multivariate data revisions. We consider systems of variables, which may be related by one or more identities. Measurement errors in each variable may be composed of news and noise errors. These errors may be correlated across time and across variables. We show how to model such systems with standard linear state space models. We motivate and illustrate the multivariate modeling framework with Swiss current account data.

Contributed Session: Economics and Business Cycles

Tuesday 28 June 11:00am-12:30pm   Room: RB212

Chair: Danilo Leiva-Leon

Combining Benchmarking and Chain-Linking for Short-Term Regional Forecasting: an Application to Spanish GDP

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In this paper we propose a methodology to estimate and forecast the GDP of the different regions of a country, providing quarterly profiles for the annual official observed data (RA). Thus the paper offers a new instrument for short-term monitoring that allows the analysts to quantify the degree of synchronicity among regional business cycles. Technically, we combine time series models with benchmarking methods to forecast short-term quarterly indicators and to estimate quarterly regional GDPs ensuring their temporal consistency and transversal consistency with the National Accounts data (QNA). The methodology addresses the issue of non-additivity taking into account explicitly the transversal constraints imposed by the chain-linked volume indexes used by the National Accounts and provides an efficient combination of structural as well as short-term information. The methodology is illustrated by an application to the Spanish economy, providing real-time quarterly GDP estimates and forecasts at the regional level. It is worth to emphasize that, from an operational perspective, timely forecasts of quarterly regional GDPs may be available with a minimum delay with respect to the national quarterly GDP release. In this way, the national figure may have appropriate regional counterparties, enhancing the informational content of analysis carried out at the aggregate level. The main contributions of our paper are: (1) A set of quarterly GDP figures at the regional level, derived in a consistent way with the official available data provided by the National Accounts, both RA and QNA. (2) Early (or flash) estimates of quarterly GDP at the regional level that may be released at the same time as the national GDP. (3) Short-term forecasts of quarterly GDP at the regional level by conditioning them on the projected path of the underlying short-term quarterly regional indicators.

A Spatial Approach to Nowcasting the Regional Gross Domestic Product

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Regional data on the gross domestic product (GDP) are often published with a substantial lag. Nowcasting can be used to estimate timely values of the gross regional product in order to obtain information on the present state of the regional business cycle. In nowcasting, the additional information available in other economic indicators is used to predict the current value of the gross regional product. Regions, however, are not economically distinct entities but in many ways interrelated. Ignoring these effects could result in less accurate predictions. The present paper extends previous studies by explicitly modelling spatial effects. The results are compared with the approach of modeling each region separately to determine whether a more elaborate spatial modelling improves on prediction accuracy. The approach is evaluated using regional GDP data for the 21 Swedish regions 1993-2008.

Forecasting of Unemployment Rate Using Simultaneous Equation Models and Other Statistical Approaches

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Unemployment as macroeconomic indicator belongs to important and closely monitored KPI's. It influences economic performance and social stability in the country and affects state budget. Forecasting with high level of reliability enables more accurate planning of public expenditures, active employment policies and social activities. Model of simultaneous equations is build on interdependent relations among endogenous and predetermined variables and has to be estimated using special techniques. For the case of unemployment two simultaneous equation models are introduced and modified according to results of correlation analysis. First model's endogenous variables are absolute numbers of employed and unemployed individuals, in second model there are unemployment rate and inflation in role of endogenous variables. Both models utilize other macroeconomic indicators as predetermined variables, such as GDP and its growth, investments and wages. Estimates of structural form of simultaneous equation models are calculated by two-stage least square method (TSLS, 2SLS) and reduced forms are appended. Calculations are supplemented with statistical and economic verification. Based on this estimates it is possible to prepare forecasts of endogenous variables relying on estimates of predetermined variables. Estimates' applicability for forecasting is tested on last three observations from the end of time series. Some preciseness measures are calculated (SSE, MSE, MAD, MAPE). Obtained predictions are compared with predictions from other statistical approaches used for statistical analysis and modelling of unemployment: it were used ordinary least square method applied to one-equation regression model, correlation analysis with delayed GDP and delayed investments (business cycle analysis), time series analysis applied to short section monthly distributed data with strong seasonality and different ways of trend estimation. Finally, described methods are assessed from the forecasts point of view. Their usability for forecasting with regard to length of forecast is compared and evaluated.

A generalized Markov-switching dynamic factor analysis for the Inputs-Output comovement in U.S.

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The dynamic behavior of labor and capital through the business cycle is crucial in the analysis of many macroeconomic issues. This paper provides a study of such dynamics from a different perspective, instead of exogenously choose proxies to analyse both inputs, I develop an econometric framework able to decompose U.S. economic activity and endogenously compute measures for its capital and labor components. I estimate the Generalized Markov-Switching Dynamic Factor Model, which presents the novelty that each factor involved in the model is governed by its own independent hidden Markov process in a unified framework. Once factors are obtained the main result shows the presence of a variation in the dynamic relationship between both inputs from positively to negatively correlated, occurred in the late 80s, which provides evidence compatible with the job automation hypothesis as a cause of jobless recoveries.

Invited session: Forecasting Support Systems

Tuesday 28 June 11:00am-12:30pm   Room: RB213

Chair: Phillip Hans Franses

A web-based Information System for supporting local government in policy implementation

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‘Digital Strategy’ is an EU-level policy aiming to promote the use of cutting-edge ICT/IS technologies in homes and companies across Europe, so as to improve standards of living and competitiveness respectively. This study introduces a web-based Forecasting Information System that was developed in order to provide support to EU governments in the implementation of ‘Digital Strategy’ via judgementally forecasting the potential success of such policies at country and regional level. This fully internet-based system provides the facilities for designing, screening and selecting policy implementations, preparation of individual and group forecasts as well as extensive monitoring through a series of statistics and graphical tools.

Investigating the impact of forecasting support systems usability on switching intention among vendors

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Forecasting support systems (FSS) are adopted in many industries to improve business operations, operational performance, and customer service. Although many FSS have been implemented, little work has been done on their usability and its relationship with the users' intention to switch to a different vendor. We analyzed responses to a web-based questionnaire from 220 forecasting practitioners using a wide range of FSS. Our study employed partial least square analysis to test the relationship of systems usability and the moderating impact of switching costs factors on the intention to switch, among the leading FSS vendors. The findings revealed significant differences among FSS vendors in terms of intention to switch due to usability and switching factors. The findings and implications for vendors' strategies to improve FSS usability as well as to identify the most important switching factors are discussed.

Human computer interaction on forecasting

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Human-computer interaction is a key field of research on decision support systems design. This article is intended to review research progress on human-computer interaction in the specific field of forecasting and forecasting support systems. Five groups of dependent variables (accuracy, satisfaction, efficiency, learning and cognitive demand) and three groups of independent variables (task, human and context) are reviewed. Then, main technological strategies based on human-computer interaction and cooperation to improve forecasting are discussed. Finally, some suggestions for future research are outlined.

Learning by experts

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We analyze the behavior of experts who quote forecasts for monthly SKU level sales data. We have data for 28 experts located in as many countries who make forecasts for a variety of pharmaceutical products for October 2006 to September 2007. We study the behavior of the experts by comparing their forecasts with those from an automated statistical program, and we report the forecast accuracy over these 12 months. In September 2007 all these experts were informed about their behavior and they experienced training at the headquarters' office, where specific attention was given to the ins and outs of the statistical program. Next, we study the behavior of the experts for the 3 months after the training session, that is, October 2007 to December 2007. Our main conclusion from the preliminary results is that in that second period the experts' forecasts deviated lesser from the statistical forecasts and that forecast accuracy has improved.

DEM2

Contributed Session: Demographics

Tuesday 28 June 1:45-3:15pm   Room: RB204

Chair: Regina Madalozzo

Consistency algorithms for regional population projections and population projection for country

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The paper presents standard ways for ensuring consistency between national and regional population projections. Population projections was given for Kazakhstan, while regional level was defined as macroregions of Kazakhstan obtained by aggregated regions according several variables. The methods presented in this work can be used for other types population projections disaggregated by different parameters.

Application of Demographic Projections for Modelling of Economic and Social Dependency in the Czech

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Demographic prognosis or projections are one of types of forecasting methods. Mostly used is cohort-component method. Firstly, assumptions about fertility, mortality and migration levels and trends and probabilities of surviving have to be prepared for each gender and age-group. Then sizes of groups of individuals defined by age and gender can be calculated for each time period and number of born babies has to be estimated. These projections with deeply elaborated assumptions, smoothing techniques and estimating procedures are used by official institutions as a background for further calculations. Basically, they can be used as a tool for analysing trends in population and communities regarding their size and structure. This serves as starting and underlying materials for decision making

about retirement age, pension system's and health care system's parameters. Furthermore, performance of economy can be forecasted as well based on demographic projections and estimation of participation and employment levels. In the paper, there are employed two existing demographic cohort-component projections introducing different population structure up to 2060. Authors present calculations of various analyses together with comparison between both results. First, trends and acceleration in economic generations are presented. Second, total, junior and senior dependency ratios and index of seniority are commented with their weighted versions. Third, index of social dependency ratio is introduced including dynamic estimates of weights for participation rates, employment and unemployment hit, education costs, health care costs, living and social demands, etc. All those estimates are not only dynamic in time but also modelled and smoothed across age groups using advanced methods of smoothing. Additional dimension for calculations mentioned here is brought by scenarios for various productive age interval determined by length of education and retirement age and differentiation for men and women. Moreover, reverse approach ensuring current level of dependency ratio is interpreted as well.

The Lee Carter Method for Estimating and Forecasting Mortality: An Application for Argentina

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This paper describes the application of the Lee-Carter model to age-specific death rates by gender in Argentina. These rates are available for the period that goes from 1979 to 2006. The index of the level of mortality for each gender, and the shape and sensitivity coefficients for nine age groups were obtained through the Lee-Carter method. The autoregressive moving average (ARIMA) and the space-state (SSM) models are used to forecast the general index for the time period that goes from 2007 to 2011 in order to project life expectancy at birth using life tables.

Labor Participation and Transitions in Fertility for Brazilian Women

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During the last few decades, women have increased their labor participation in Brazil. In the early 1970's, approximately 20% of women participated in the labor market. According to data obtained by IBGE in December 2010, 48.9% of women were economically active. At the same time, the fertility profile changed. According to the World Bank, Brazilian women had a fertility rate of 6.2 in 1960 and, in 2008, this index was 1.8, which represents a fertility below the replacement rate. This paper will present Brazilian trends during the last and present century, emphasizing the importance of labor profiles on fertility decisions. Tsafack Nanfosso and Zamo-Akono (2010)

model variables of fertility, health and labor participation in Cameroon and conclude that although labor participation reduces fertility rates, when a woman has a child, she increases her propensity to work. Another possibility is the one reached by Soares and Falcao (2008) in which the increase in labor participation, motivated by the decline in wage discrimination against women, had the effect of reducing fertility. Based on these different possibilities, this work uses Brazilian data from PNAD (Pesquisa Nacional de Amostra por Domicilios) to understand the cause of this relationship as well as projecting consequences of these choices to the economic development of women.

TOU1

Contributed Session: Tourism

Tuesday 28 June 1:45-3:15pm   Room: RB205

Chair: Egon Smeral

Tourism Forecasting: Accuracy of Econometric Models in Forecasting the Recession 2009

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This study evaluates the forecasting accuracy of alternative econometric models in the context of predicting the annual international tourism demand for a range of countries/country groups such as Australia, Canada, EU-15, Japan and the USA in the recession year 2009. We used annual data for a long observation period (1977-2009). Tourism demand is measured in terms of tourist expenditure by outbound travelers (tourism imports at constant prices and exchange rates). We compared the performance of two different models: the growth rate model and the time-varying parameter (TVP) model in both level and difference terms. Forecast accuracy for the year 2009 is assessed in terms of error magnitude based on the backcasting results (estimation period 1977-2009) as well as on out of sample forecasts (estimation period 1977-2008). The empirical results show that neither the time-varying parameter (TVP) model nor the growth rate model can outperform the other one constantly in all cases. Furthermore, the forecasts of the difference TVP model did not indicate superiority over TVP model in terms of levels.

It's all happening at the zoo: forecasting the impact of weather and climate change on tourism

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Warmer, drier weather brought by anticipated global climate change might be expected to encourage use of outdoor leisure facilities. Yet few studies assess the effect of weather upon visits to open air leisure attractions. Our concern here is to assess the impact of climate change on tourism. Evidence is available for a major outdoor visitor attraction, Chester Zoo, in England's North-West, which is an exemplar of the sector. Statistical time series models are used to analyse both the short-run impact of weather and the long-run impact of climate upon visitor activity at Chester Zoo. A dynamic regression model shows how visit levels, weather and a range of socio-economic variables interact. The model is estimated over the period January 1978 to November 2004, with a hold out sample from December 2004 to the end of 2010. Visitor behaviour is mainly influenced by the annual rhythm of the year and the pattern of holidays. Visits are redistributed over time in accordance with the weather: Temperature has no significant effect on visit levels. Visitors frustrated by rainy weather one day turn up later when the weather improves. A natural experiment, the prolonged closure of the zoo during the foot and mouth crisis of 2001, suggests there is an upper limit on the amount of time customers are prepared to defer their visits. Comparison of actual visitor numbers with out-of-sample forecasts allows us to assess the validity of the model. Ultimately, conditioning on realistic scenarios of future weather patterns suggests climate change will have no apparent long-run impact on visitor numbers.

Booking Horizon Forecasting with Dynamic Updating: A Case Study on Hotel Reservation Data

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A highly accurate demand forecast is fundamental to the success of every revenue management model. As often required in practice and theory, we aim to forecast the accumulated booking curve as well as the number of expected reservations for each day in the booking horizon. To reduce the high dimensionality of this problem, we apply singular value decomposition on the historical booking profiles. The forecast of the remaining part of the booking horizon is dynamically adjusted to the earlier observations using the penalized least squares and the historical proportion method. Our proposed updating procedure considers the correlation and dynamics of bookings within the

booking horizon and between successive product instances. The approach is tested on real hotel reservation data and shows a significant improvement in forecast accuracy.

Time Varying Parameter Error Correction Model Approach to forecasting tourist arrivals in South Africa

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South Africa has become a very popular tourist destination over the past 15 years as the country had a remarkable influx of tourists after political change. Tourists from around the world travel to South Africa to indulge themselves in the warm weather; to enjoy the beautiful coastline, wildlife and historical attractions. In 2009, the country was ranked twenty-sixth most popular destination in terms of international arrivals. While forecasting tourism arrivals have been explored elsewhere in the world, little research is available on forecasting tourism demand in South Africa. Three tourism demand studies have been completed that identified the determinants of tourism demand for Africa and South Africa (see Saayman and Saayman, 2008; Naudé and Saayman, 2005 and Seetanah et al., 2010). However, none of these studies attempted to forecast tourist arrivals. In 2009, Saayman and Saayman used time series techniques to forecast arrivals, which have the disadvantage of not providing any policy recommendations. In the field of tourism forecasting there has been renewed interest in the estimation of econometric models with varying degrees of sophistication, as is evident from a recent survey by Song and Li (2008). The application of time-varying parameters has been successful in forecasting tourism arrivals taking into account the changing behaviour of tourists. Therefore, this paper aims to expand on forecasting intercontinental tourism demand for South Africa by applying time-varying parameters to single equation estimates, providing more accurate forecasts of arrivals based on these determinants. Ex-post forecasts are done for tourist arrivals from Asia, Australasia, Europe, North America, South America, and the United Kingdom and forecasting accuracy evaluated by determining the Mean Absolute Percentage Error (MAPE), Root Mean Percentage Square Error (RMPSE) and Theil's U of each model.

ENR1

Invited session: Modeling and Forecasting - Power Markets

Tuesday 28 June 1:45-3:15pm   Room: RB206

Chair: Carolina García-Martos

Electricity load forecasting with SVD-based exponential smoothing

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This paper proposes a singular value decomposition (SVD) based exponential smoothing method for forecasting electricity load. The advantage of using an SVD-based method is that it enables dimension reduction by utilizing similarity between different periods in the seasonal cycle. SVD transforms the data to an orthogonal space, and allows the focus to be on forecasting only the components that capture a major proportion of variance in the data, thereby reducing the number of models to be considered. In this paper, we propose a discount weighted SVD method in order to enable more recent observations to be assigned greater weight in the dimension reduction. Using half-hourly load in Great Britain, we provide out-of-sample point forecast comparison of the proposed method with other SVD-based forecasting methods.

Quantile forecasting of wind power using variability indices

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Wind power forecasting techniques have received substantial attention recently due to the increasing penetration of wind energy in national power systems. While the initial focus has been on point forecasts, the need to quantify forecast uncertainty and communicate the risk of extreme ramp events has led to an interest in producing

probabilistic forecasts. Using four years of wind power data from an individual wind farm, we develop quantile regression models to generate short-term probabilistic forecasts from 15 minutes up to 6 hours ahead. More specifically, we investigate the potential of using various variability indices as explanatory variables in order to include the influence of changing weather regimes. These indices are extracted from the same univariate wind power series and optimised specifically for each quantile. The forecasting performance of this approach is compared with that of various benchmark models. Our results demonstrate that variability indices can increase the overall skill of the forecasts and that the level of improvement depends on the specific quantile.

A sustainable mix of Spanish electricity generation for the 2020

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The aim of this work is to obtain an estimate of the energy mix for the 2020 horizon, with an aim toward the most sustainable generation of electricity that is possible. This generation will have to honor the environmental agreement reached at the level of the Spanish state and the European Community. The model used considers energy demand for every month, represented by an approximated Load-Duration curve. These curves have to be filled with the different generating sources (nuclear, gas, coal, hydraulic, etc.), according to economical, operational and environmental criteria. Then, the optimal mix is obtained minimizing the global cost of generation for the whole year. We show the results coming from a number of scenarios, as many random factors are involved in long-term coordination problems (e.g. water inflows). Previously the daily demand as well as peak and base hourly load at 2020 have been forecasted, by means of a dynamic regression model for time series. The forecasting model contains macroeconomic variables, such as the Industrial Production Index (IPI) and the interannual variation rate of the Consumer Price Index (CPI). Moreover, weather variables that influence electricity demand, such as the number of days with temperatures below 0 C degrees in the Iberian Peninsula, have been selected as well. The results emphasize the trade-off between generation cost and CO_2 emissions. With the current composition of the generation park and the probable increase in demand, countries like Spain should increase their investment in renewable energies in order to achieve their environmental commitments.

Extracting Common and Specific Dynamic Components from the vector of electricity prices

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Apart from the common gradually liberalization process, there are 'global circumstances' that can affect the prices not only in the European markets but all across the world, such as the price of fuels, which are necessary to make power units to produce electricity and that heavily affect their costs. Moreover, each market (country) presents some peculiar features that make also of interest to be able to extract the evolution over time of these specific dynamics. In this work we propose a decomposition technique for vectors of time series. Usually, in Dynamic Factor Analysis (DFA) it is assumed that common factors evolve over time but that specific ones do not. This can be mathematically convenient but it is not very realistic. In fact, when dealing with real data, there is sometimes a need of a subsequent step after estimating the parameters involved in the DFA, just to capture any remaining correlation along each specific factor. In a second step, univariate AR models are fitted for the estimated specific factors (Peña and Poncela, 2004 and 2006 and Ortega and Poncela, 2005). This two-step estimation procedure produces, under certain conditions, biased estimators of the parameters. To overcome this problem, a joint estimation procedure is here developed. The complete model including not only the decomposition of the original series into common and specific components and the common dynamics, but also the univariate modeling of specific factors is written under its state-space formulation, and a joint estimation is carried out. A comparison between these two procedures is carried out in a Monte Carlo study. The new estimation procedure is applied to decomposing the vector of daily prices in several European electricity markets (EXAA, EEX, Powernext and MIBEL) and to provide forecasts of daily prices.

Contributed Session: Evaluation

Chair: Rob Hyndman

A Joint Test of Superior Predictive Ability for Chilean Inflation Forecasts

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Optimality under quadratic loss implies that forecasts built using a large information set should perform at least as well as forecasts built using a more restricted and nested information set. In this article we use a joint test of superior predictive ability to test this optimality condition for the term structure of several Chilean inflation forecasts coming from the following sources: Bloomberg, Consensus Economics, the Survey of Professional Forecasters and an average of selected seasonal univariate models. We do this by taking advantage of the fact that these sets of forecasts are built at different moments in time and, more importantly, using different and nested information sets. Our results indicate that the null hypothesis of optimality under quadratic loss cannot be rejected when Mean Squared Error is used to evaluate the term structure of the forecasts. Nevertheless, when the joint test is carried out to evaluate the term structure of the Mean Squared Forecasts, as suggested by Patton and Timmermann (2010), the joint test rejects the null hypothesis of optimality. Further analysis of our results reveals that this rejection is associated with a violation of an orthogonality condition that should be satisfied when forecasts are optimal. Moreover, this violation seems to stand both across different sources of forecasts and across different forecasting horizons. This suggests that there is room for improvement in the term structure of Chilean inflation forecasts.

Comparing Spatial Predictions

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Under a general loss function, we develop a hypothesis test to determine whether a significant difference in the spatial predictions produced by two competing models exists on average across the entire spatial domain of interest. The null hypothesis is that of no difference, and a spatial loss differential is created based on the observed data, the two sets of predictions, and the loss function chosen by the researcher. The test assumes only isotropy and short-range spatial dependence of the loss differential but does allow it to be non-Gaussian, non-zero mean, and spatially correlated. Constant and non-constant spatial trends in the loss differential are treated in two separate cases. Monte

Carlo simulations illustrate the size and power properties of this test, and an example based on daily average wind speeds in Oklahoma is used for illustration.

Specification Tests for Nonlinear Time Series Models

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We propose a new distribution (density) forecasting evaluation tool. We state it in form of model adequacy test for parametric conditional distributions in nonlinear time series models. Such evaluations are necessary in many areas of macroeconometrics and financial econometrics, for example, to make a good forecast of downside risk in risk-management, especially on nonlinear portfolios. We formalize the ideas of graphical density forecasting evaluation of Diebold et al. (1998). Our method can capture a wider set of misspecifications than a Kolmogorov type test, say Bai (2003). Uniformity and independence of pseudo-residual series obtained by applying the conditional probability integral transform are simultaneously checked by means of continuous functionals of a bi-parameter empirical process of contemporaneous and lagged transforms. We establish weak convergence of the empirical process under parameter uncertainty. The tests have power against local alternatives converging under the null with a parametric rate and solve consistency problems of previous single parameter tests. We justify a parametric bootstrap approximation that accounts for parameter estimation effects. We extend the test in two directions: higher order joint distributions and multiple lags are considered. We derive an explicit formula to compute test statistics without numerical integration. Monte Carlo experiments show that the test has a good power against many different alternatives, both in linear and nonlinear dynamic models. We check adequacy of various heteroscedastic models for stock exchange index data.

Evaluating extreme quantile forecasts

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I will review and discuss various methods for evaluating forecast distributions, particularly when extreme quantiles are of interest. This situation arises, for example, in forecasting peak energy demand and in forecasting the tails of return distributions. The review will include some old ideas such the Cramer-von-Mises statistic, Kolmogorov-Smirnov statistic and Probability Integral Transform, as well as some new ideas such as the Mean Absolute Excess Probability. The methods will be discussed in the context of forecasting peak electricity demand using semi-parametric models for South Australia.

Contributed Session: Finance

Tuesday 28 June 1:45-3:15pm   Room: RB209

Chair: Claudio Antonini

Can Dividend Yield Predict Stock Return

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Using lagged financial ratios to predict stock returns has a long tradition among practitioners and academics. The systematic study of this problem dates back to at least a few decades. The prevalent tone in the vast return prediction literature is that financial ratios possess predict power in the framework of predictive regressions. Amongst all financial ratios investigated in stock return predicting literature, dividend yield receives most of the attention. As pointed out by Goyal and Welch (2003), that DY seems to predict stock returns ranks amongst the most important findings of academic finance. The traditional OLS estimator, however, is subject to a finite sample bias (Stambraugh,1999) in predictive regressions and hence leads to problematic statistical inference. This paper proposes a non-parametric method to remove such bias that is based on Quenouille's (1949; 1956) jackknife approach. The effectiveness of the proposed method is demonstrated by simulations. An empirical application to stock return prediction using dividend yield highlights the differences between the results by the bias-reduced estimator and those by the OLS estimator. The significant predictive power by dividend yield under ordinary least squares become insignificant after adjusting for the finite sample bias.

Modelling government bonds in the Australian fixed-income market

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Accurately forecasting interest rates is of fundamental interest to both academics and market practitioners. In this paper, we study the predictive performance of three different models in forecasting the government bond yields in Australia. We compare three different term structure models: the Diebold and Li (DL) model, the Functional Signal

plus Noise (FSN) model, and the essentially affine model. To provide a more powerful and robust method of term structure approximation for DL and FSN model, we propose a state-space specification with maximum likelihood (ML) parameter estimation. For the essentially affine model, we use Duffee's (2002) quasi maximum likelihood (QML) estimation procedure. Comparing to standard estimation procedures, our models provide a more stable and robust result. Evaluating the models using Root Mean Square Error (RMSE) metric and economic profit criteria, we demonstrate that all three models outperform a random walk in modelling the Australian government term structure. By using the RMSE and loss functions from pairs trading algorithms, we further compare the forecasting ability of DL, FSN and affine model over different forecast horizons and periods. These results provide useful insights for decision making by monetary policy makers, portfolio managers and individual financial planners.

Forecasting the Australian Itraxx credit default swap index

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Although the Australian credit default swap market it relatively immature, it provides a direct view of credit quality and is used extensively to protect against default by individual corporations. This study investigates the predictability of the equally-weighted Australian Itraxx credit default swap index of the 25 most liquid reference entities. Rather than forecast the index directly, we focus on modelling and forecasting the spreads of the constituents using the CreditGrades structural model and then aggregating the spreads to calculate the index. CreditGrades is based on the contingent claims framework, under which equity and debt represent an option on the reference entity's assets and thus the default probabilities priced by credit default swaps rely predominantly on easily obtainable market and balance sheet parameters. The models allows financial firms, with which structural models have traditionally struggled, to be included in the sample by way of a model calibration procedure, and their inclusion is found not to decrease the accuracy of the model. Following the testing of a number of historical and market-based idiosyncratic and systematic inputs we conclude that model accuracy in the earlier stages of the sample period is consistent with previous literature, yet model and market spreads diverge considerably throughout the more volatile periods of the sample. Although the use of a forward-looking option-implied volatility input results in model spreads fitting market spreads less closely than those using long-term historical volatility inputs, they are however, more correlated with medium term changes in market spreads and produce significantly more accurate index forecasts.

The Use of the q-Gaussian Distribution as a Leading Indicator in Financial Forecasting

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Recent developments have shown that the q-Gaussian distribution—used in a multitude of fields to reproduce fat tails—generalizes the (Ito-Stratonovich) Fokker-Planck equation through the presence of (additive and multiplicative) noises. At the same time, we know that such an equation has been used to describe financial returns (e.g., aerospace industry indices, DAX, DJIA, NASDAQ, S&P500) but under the assumption of a fixed value for q. Independently of the above, we know that the q-Gaussian distribution is related to the t-distribution, to the ARCH(1)/GARCH(1,1) coefficients, and to their confidence intervals. Furthermore, we have demonstrated that they are time-varying. Following that reasoning, we will show to what extent the q parameter of the q-Gaussian distribution can be used as a leading indicator for financial time series and how it correlates with related economic events, particularly (a) through the q-kurtosis and (b) interpreting trading volume as a multiplicative scaling factor on the conditional volatility. The main reason behind this conclusion is that a change in volume can be understood as a proxy for the diversity of interpretation of information arriving in the market and the random arrival of multiple sources in a time period. This concept is thereby related both to the Multiple Distribution Hypothesis and the definition of the conditional t-distribution as a mixture of normals. Changes in the traded volume imply a change in the number of degrees of freedom of the t-distribution, thereby implying changes in q. These results will be applied to the S&P500 index.

ECO3

Invited session: Forecasting with Multivariate Time Series Models

Tuesday 28 June 1:45-3:15pm   Room: RB210

Chair: George Athanasopoulos

Do Jumps Matter? Forecasting Multivariate Realized Volatility allowing for Common Jumps

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Realized volatility of stock returns is often decomposed into two distinct components that are attributed to continuous price variation and jumps. This paper proposes a tobit multivariate factor model for the jumps coupled with a standard multivariate factor models for the continuous sample path to jointly forecast volatility in three Chinese Mainland stocks. Out of sample forecast analysis shows that separate multivariate factor models for the two volatility processes outperform a single multivariate factor model of realized volatility, and that a single multivariate factor model of realized volatility outperforms univariate models.

Forecasting US Interest rates with Cointegrated VARMA Models

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In this paper, we bring together some recent advances in the literature on vector autoregressive moving-average models creating a relatively simple specification and estimation strategy for the cointegrated case. In order to show its potential usefulness, we apply the procedure in a forecasting exercise for US interest rates and find promising results.

Estimation and testing for cointegrating relations in VARMA models

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We show that the presence of cointegration relations in vector ARIMA time series models imposes certain restrictions on the zeros of the moving average matrix polynomial, and their implications on the specification of the model. We also develop a procedure for the estimation and testing of cointegrated VARMA models within which these restrictions can be tested. This procedure is illustrated with some examples. Finally, we conduct a Monte Carlo experiment to compare the performance our method with some popular testing procedures in the literature.

Forecasting with EC-VARMA models

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In this paper we propose an algorithm for identifying and estimating cointegrated VARMA models. Through Monte Carlo simulations we evaluate the performance of the algorithm in correctly identifying the cointegrating rank and VARMA dynamics for some pre-specified data generating processes. We also evaluate the forecasting performance of such models against unrestricted alternatives. We apply this algorithm to a real data set for both forecasting and policy analysis and again compare the performance of the model identified to alternative unrestricted models.

Invited session: Uncertainty in Macroeconomic Forecasting II

Tuesday 28 June 1:45-3:15pm   Room: RB211

Chair: Laurent Ferrara

Combining the forecasts in the ECB SPF: Can anything beat the simple average?

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In this paper, we explore the potential gains from alternative combinations of the surveyed forecasts in the ECB Survey of Professional Forecasters. Our analysis encompasses a variety of methods including statistical combinations based on principal components analysis and trimmed means, performance-based weighting, least squares estimates of optimal weights as well as Bayesian shrinkage. We provide a pseudo real–time out-of-sample performance evaluation of these alternative combinations and check the sensitivity of the results to possible data-snooping bias. The latter robustness check is also informed using a novel real time meta selection procedure which is not subject to the data-snooping critique. For GDP growth and the unemployment rate, only few of the forecast combination schemes are able to outperform the simple equal-weighted average forecast. Conversely, for the inflation rate there is stronger evidence that more refined combinations can lead to improvement over this benchmark. In particular, for this variable, the relative improvement appears significant even controlling for data snooping bias.

Forecast Uncertainty of Combined Forecasts

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We show that true forecast uncertainty of a combined forecast is not the variance of the average forecasts but rather average of the variances of the individual forecasts. Otherwise, higher moments of the cross sectional distribution (e.g.,their disagreement) of forecasts will not be reflected in the combined forecast. This result can be best understood by specifying an appropriate loss function of a policy maker using the Bayesian model averaging paradigm.

How Informative Are Central Bank Assessments of Macroeconomic Risks?

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Many central banks issue statements about the balance of risks to their macroeconomic forecasts. According to the balance-of-risks definition commonly used by central banks, a balance of risks that is tilted to the upside [downside] implies that the realization is expected to lie above [below] the central forecast. Based on the inflation risk forecasts of the Bank of England and the Sveriges Riksbank, however, we find no systematic connection between risk assessments and forecast errors. We therefore conclude that it seems questionable whether macroeconomic risk forecasts are meaningful.

The possible shapes of recoveries in Markov-Switching models

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This paper explores the various shapes the recoveries may exhibit within a Markov-Switching model. It relies on the bounce-back effects first analyzed by Kim, Morley and Piger (2005) and extends the methodology by proposing i) a

more flexible bounce-back model, ii) explicit tests to select the appropriate bounce-back function, if any, and iii) a suitable measure of the permanent impact of recessions. This approach is then applied to post-WWII quarterly growth rates of US, UK and French real GDPs.

EBC8

Contributed Session: Economics and Business Cycles

Tuesday 28 June 1:45-3:15pm   Room: RB212

Chair: Kjetil Martinsen

Forecasting Final Data Revisions in Real Time

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Over the last decade, the literature on models of data revisions has seen an exponential increase, but so far there has been no comparison among the different classes of methodologies used. Therefore, the contribution of this paper is to provide a common framework to compare three chosen methodologies. The first methodology, inspired by Aruoba (2008), consists of an agnostic OLS model of past revisions (Agnostic Models). The second is a state space model that hinges on the Real Time Vintage data (SSM-RTV). And to conclude, the last one, due to Cunningham et al. (2007) consists of a flexible state space model estimated in two steps that uses End of Sample vintage data (SSM-EOS). The out-of-sample forecasting exercise is performed using three U.S. major macroeconomic series - namely, the real output, nominal output and inflation measured by the output deflator - and compares the real-time;final revision forecasts of the initial announcements released from 1984Q2 to 2003Q1. The comparison of the methodologies is done through the ratio of their root mean squared forecast errors (RMSFEs) with the ones obtained by a zero-revision-forecast model (the …final observed data is estimated to be equal to the initial announcement) and a ranking of clusters of forecasting models based on a robust Diebold-Mariano test over an hierarchy of models, ordered according to the adjusted Clark and West (2007) RMSFE ratios, allows to identify SSM-EOS more often among the best models that beat the zero forecast.

Estimating and forecasting monthly Korean GDP with mixed frequency macroeconomic variables

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GDP is one of the most important and extensive economic indicators, which is acknowledged to represent the unobserved state of the economy. Therefore it is a major concern of economic agents to estimate and forecast GDP. But macroeconomic variables can be collected at a variety of frequencies. Some of them are announced on a quarterly basis like GDP, but most of them are collected at a lower frequency than GDP. Hence, a low number of observations can cause drawbacks in the quality of quantitative economic analysis using GDP. In this paper, the extensive technique of estimating monthly GDP is suggested. By using various relationships with other mixed frequency macroeconomic variables, monthly GDP is estimated. To do so, this paper introduces the state space representation of GDP forecasting model that incorporates mixed frequency data in estimation without extra data transformation. This technique is very sensitive to what kind of macroeconomic variables are used to estimate monthly GDP. Therefore, various macroeconomic variables are tested to make more robust monthly GDP estimates. In order to judge whether monthly GDP is estimated appropriately, actual quarterly GDP is compared to estimated quarterly GDP at a real time basis.

Economic recession in the Czech Republic and its impact on total factor productivity: a comparison of approaches

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Over the past two decades economic recessions occurred in the Czech Republic. Recessions influenced all economic fields, e.g. production, export and import, labor market and last but not least total factor productivity which the economists use as one of the suitable indicators to evaluate economic performance. Multifactor productivity with two inputs uses hours worked as the labor input and capital stock as the capital input. Both of the inputs are highly influenced by the recession. For the analysis of the total factor productivity index or econometric approach can be used. The index number approach does not need the long time series of observations, while the econometric approach needs more than ten observations of one variable. The results using econometric approach are sensitive to the quality of the data and to the number of observations. Selection of the approach depends on the type of analysis researcher would like to do. The aim of this paper is to analyze the influence of the economic recessions on total factor productivity in the Czech industries in the period between 1995 and 2008 employing econometric approach and index number approach and to compare the results by these approaches.

Forecasting government consumption

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Quarterly government consumption (GC) is typically assumed to be an exogenous variable in macroeconomic and other models, given that it is considered that governments decide on a purely discretionary manner the level of GC in a particular year. As a consequence, the forecast of this item has hardly received any attention in the academic literature. Nevertheless, this component of GDP amounts to some 20% of the total in the average OECD country. In this paper, we discuss several issues on the forecastability of GC by using multivariate, mixed-frequencies models: (i) can quarterly GC be nowcast in real-time; (ii) is this useful for nowcasting quarterly GDP?; (iii) is GC a truly exogenous variable? We find that government consumption is more forecastable that typically acknowledged, along two dimensions: (i) in the very short-run, were available (but not used before) monthly data play a relevant role; (ii) 1 to 4 quarters ahead, because GC is not as exogenous as commonly though.

FSS3

Invited session: Forecasting Support Systems

Tuesday 28 June 1:45-3:15pm   Room: RB213

Chair: Paul Goodwin

Do experts take model-based forecasts into account? And if so, does it help?

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When model-based forecasts are available, these can be incorporated in final expert forecasts. Usually it is assumed that experts do include these model forecasts, and the resultant forecasts are then treated as judgmentally adjusted forecasts. Interestingly, it is rarely known to what extent experts actually consider those model-based forecasts, where at one end it might even be possible that the latter are in fact fully ignored. In this paper we analyze expert forecasts and their associated model-based forecasts, and we seek to answer three questions: (1) How is the final expert forecast related to the model forecast? (2) How is this relation influenced by other factors (such as sales levels, volatility)?, and (3) How does this relation influence forecast accuracy? Based on the literature, we formulate various hypotheses. Next, we examine the validity of these hypotheses using a unique database where we have expert and model forecasts for stock-keeping unit (SKU) level sales data. To summarize the wealth of information in the data, we propose a two-level hierarchical model, where the first level concerns the relation between model forecasts and expert forecasts, and the second levels involves moderators of this relationship. Bayesian estimation methods are used, and the outcomes provide answers to the first two questions. To answer the third question, we correlate forecast accuracy with the estimation results.
Our results show that some experts fully incorporate model-based forecasts and that some other experts fully ignore those model forecasts, and everything in between. We find that the link between expert and model forecasts is moderated by average sales volume, variation in sales volume and by forecast horizon. We also find that the relation between expert and model forecast strongly influences forecast accuracy. That is, the more the expert incorporates the model forecast, the better it is.

Are Forecasting Support Systems Always Useful? An Assessment through the Lens of Task-Technology Fit

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The extent to which a technology supports individuals in the performance of their portfolio of tasks is defined as task-technology fit. Not all tasks require systems to support them while certain tasks are complex enough that unsupported human judgment is inadequate for optimal performance. Forecasting lends well to a critical examination through the task-technology lens since the fit between forecasting support systems (FSS) and forecasting performance is made complex by the interplay of human abilities, technologies, and intricacies of the forecasting task. In this study, we adapt task-technology framework from information systems (IS) research to the domain of time series forecasting. We use this framework to propose forecasting task characteristics and examine usefulness of FSS for tasks with specific characteristics. To this end, we present results from a preliminary test of our proposed framework. Herein, we find that for well-structured forecasting tasks, judgmental forecasts are as effective as FSS but as tasks become less structured, FSS significantly outperform judgment.

Trust in Forecast Advice: Effects of Format, Explanations and Explicit Assessments

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Trust placed on advice from a forecasting support system is a core determinant of whether recommendations from that system will be accepted or whether they face extreme discounting in favor of the decision maker's own judgments. Antecedents of trust may include the presentation format of the advice and the existence of any forecast support material (e.g. explanations) used to justify the given recommendations. To investigate the effects of such factors on stated vs revealed trust in forecast advice and the resulting judgmental adjustment behaviors, two studies were designed. The first study explored i) the impact of presenting forecast advice using a prediction interval format vs. a best-case/worst-case format, and ii) whether point predictions provided an added value for the two formats. The results indicated that advice expressed in a best-case/worst-case format with accompanying point predictions was more effective, overall, in attaining higher levels of trust. Based on these findings, a second study was conducted to investigate i) the effects of presenting explanations along with the forecasts, and ii) the influence of asking for explicit assessments of trust. The findings reveal that advice given by a forecast support system is adjusted less when explicit trust assessments are made. Overall, receiving explanations in addition to forecast advice

appears to significantly influence the users' adjustment patterns. Implications of these findings are discussed and future research directions are given.

Optimism bias and differential information use in forecasting

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Companies tend to produce over optimistic forecasts of demand. Psychologists have suggested that optimism, at least in part, results from selective bias in processing information. When high demand is more desirable than low demand information favouring high demand may carry more weight that information that suggests the opposite. To test this, participants in an experiment used a prototypical forecasting support system to forecast the demand uplift resulting from sales promotion campaigns. One group was rewarded if demand exceeded a certain threshold. All of the participants were also supplied with information some of which supported an uplift greater than the threshold and some of which suggested that the uplift would fall below this value. This enabled us to assess the extent to which those who were rewarded if the uplift exceeded the threshold paid more attention to the positive information than those who were not rewarded. We report the results of our experiment and its implications for the treatment of information within forecasting support systems.

Invited session: Singular Spectrum Analysis

Tuesday 28 June 3:45-5:15pm   Room: RB204

Chair: Hossein Hassani

Extracting US Business Cycle Using Sequential Singular Spectrum Analysis

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In this paper we consider the sequential singular spectrum analysis (SSA) to the USA quarterly, seasonally adjusted, GDP series. The series is decomposed into a sum of mutually orthogonal components, such as trend, cycles and noise. The results indicate that the decomposition step leaves a significant amount of information within the noise component. However, performing SSA on the extracted noise component, we are able to extract desired information. This also helps to have a better signal extraction procedure.

A New Criterion for Measuring Strong separability in the Singular Spectrum Analysis

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Singular Spectrum Analysis (SSA) is one of the most powerful SVD-based techniques that can be used for both reducing noise level and modeling time series data. SSA is a non-parametric method and can be applied to analyze time series of complex structure. The main purpose of SSA is a decomposition of the original series into a sum of series, so that each component in this sum can be identified as either a trend, periodic or quasi-periodic component (perhaps, amplitude modulated), or noise. The notion of separability of series plays a fundamental role in the formalization of this problem and precision of the forecasts resulted from SSA. Since exact separability does not

happen for real-life series, in practice we can talk only about approximate separability. Although there are some criteria for measuring weak separability in the literature of SSA, but for strong separability no criterion has been introduced. In this talk based on coefficient of variation of the singular values of the trajectory matrix in the SSA, we propose a new criterion for Measuring Strong separability. Also properties of this measure will be discussed in the univariate and multivariate cases.

A Filter Based Correlation Coefficient by Using Singular Spectrum Analysis

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It is well known that the Pearson\'s product-moment correlation coefficient is very sensitive to the presence of outliers. The empirical study shows that the Spearman's and Kendall's rank correlation coefficients are not sufficiently robust when the percentage of outliers increases in the data set. Therefore, they cannot provide a robust alternative to the product-moment correlation coefficient. In this respect, the Least Median Square-based (LMS-based) correlation coefficient indeed achieves the goal for which it was constructed, because it is able to produce satisfactory results even in the presence of a large amount of outliers. According to this approach, the detected outlier will be removed. However, this removal may not be a valid approach, since it may ignore some of the most important information in our data set. Therefore, considering the techniques to deal with outliers are one of the most important part of the correlation analysis. In this paper we consider an alternative approach. According to the proposed approach, we start with filtering the perturbed data in order to reduce the effect of existence of outliers, and then we obtain the correlation from the filtered data. We use the Singular Spectrum Analysis (SSA) technique as a filtering tool. SSA is one of the most powerful SVD-based techniques that can be used for both reducing noise level and modeling time series data incorporating the elements of classical time series analysis, multivariate statistics. We also compare the performance of the filter-based approach with LMS method in situations where there are several outliers in the data sets.

On distinguishing between Common Singular Spectrum Analysis (CSSA) and Multivariate Singular Spectrum

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Multivariate SSA (MSSA) is an extension of SSA to more than one time series (Golyandina et al, 2003). Common Singular Spectrum Analysis (Viljoen and Nel, 2010) extend SSA to two or more time series which share a common R-flat, by using the common principal component (CPC) and partial common principal component (CPC(q)) approach of Flury (1988). The purpose of this talk is to investigate similarities between CSSA and MSSA. As an illustration a practical example is discussed.

TOU2

Contributed Session: Tourism

Tuesday 28 June 3:45-5:15pm   Room: RB205

Chair: Miriam Scaglione

Forecasting Hotel Room Rates in Hong Kong, Singapore and Taiwan

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Most econometric studies rejected the Law of One Price (LOP) for a variety of goods and services unless using long spans of data or large panels. This paper aims to test the existence of LOP for the hotel sector among three competing Asian destinations (Hong Kong, Singapore and Taiwan). The cointegration approach and error-correction models are employed to examine the long-run equilibrium relationships between the hotel room rates in these three different locations. Monthly hotel room rates and exchange rates over 1998-2010 are used to test the short-run and long-run relationships among the hotel room rates of the three destinations, with the autoregressive distributed lag (ARDL) bound test. We uncover a long-run relationship among the hotel prices of the three locations. The co-movement of the hotel room rates in two destination pairs (Hong Kong-Singapore, and Hong Kong-Taiwan) are stronger than that in the third pair (Singapore-Taiwan). The MAPE and RMSE are used to compare the forecasting accuracy of the vector error-correction models with a group of benchmark statistical models (naive, exponential smoothing, and ARMA models). Based on the empirical results, a new approach to forecasting hotel room rates is proposed.

How indirect indicators anticipated the 2008-09 slowdown in tourism in the canton of Valais (Switzerland)

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Since 2006 and twice a year (for the summer and winter season) the barometer of tourism of the canton of Valais produces estimations of tourism frequentation for the latest months of the past season (flash estimations) and also forecasts for the following season for each one of the 19 Valais' destinations. In IFS 2010, a research was presented, which studied, in a systematic way, which are the best explanatory variables, such as the receipts from the main supermarkets and drugstores; electricity consumption; the amount of trash and used water; and transportation statistics (cars and train frequentation) using the theory of errors by in Hibon, M. & Makridakis, S. (2000). The present study used causal models as the one in 2010 but has a twofold objective. Firstly, Structural Times Series and Neural Networks as methods are put the methods in competition. Secondly, two different sets of explanatory variables are used - namely, raw data and decomposition in factors. The downturn in tourism of November – December 2008 and the whole year 2009 up to September 2010 will be use as post evaluation sample.

ENR2

Invited session: Renewable Energy Forecasting

Tuesday 28 June 3:45-5:15pm   Room: RB206

Chair: Emil Pelikan

Forecasting of Wind Ramp Events

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A ramp event is commonly defined as a power output change that exceeds certain percentage of the nominal power of a wind farm, within a specified period of time. The ability to forecast such events is crucial for effective operation of electric power grid. Importance of ramp predictions will increase with the level of wind penetration in electric power systems around the world. Causes of ramp events range from passage of large-scale weather systems to boundary-layer stabilization at nightfall. The cold front is an important weather system that can lead to large ramp events. A dramatic upward ramp can occur as strong winds pass behind the front. This is usually followed by a serious downward ramp after the cold passage moved through. Existing approaches to ramp forecasting are typically based on a combination of Numerical Weather Prediction (NWP) model and statistical methods. In this contribution, we introduce a new technique based on pattern recognition applied to NWP forecasts. In this initial study, we concentrate on identification of cold fronts and their movement patterns by extracting their meteorological characteristics. The primary feature used for cold front identification is thermal gradient, i.e. the spatial distribution of temperature and dew point. The gradient can be detected using image filtering and thresholding techniques. This information is complemented by secondary features: surface pressure troughs and distribution of wind fields, which can be identified using relation-based aggregation and fluid motion techniques, respectively. All features are eventually combined to indicate the presence and location of the front. The changes of location in subsequent NWP forecast steps are used to estimate the trajectory and speed in which the frontal system moves. Ramp events are predicted taking into account the relative position of the location of interest (a wind farm), and extracted characteristics of the front.

Regional Photovoltaic Power Prediction Based on ECMWF Forecasts

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Large scale grid integration of PV power requires forecast information on the expected feed-in as a basis for grid management and day-ahead and intra-day trading of PV power on the energy market. In Germany, with an installed power of more than 17 GW at the end of 2010, PV power prediction services are already an essential part of the grid and system control. Here, we present an approach for regional PV power prediction based of irradiance and temperature forecasts of the European Centre for Medium-Range Weather Forecasts (ECMWF). In a first step, site-specific hourly irradiance forecasts are derived from the low-resolution ECWMF forecasts involving combination with a clear sky model in order to consider the typical diurnal course of irradiance and a post-processing procedure using measured irradiance data. Power predictions are derived from the refined irradiance forecasts with an explicit physical modelling, including conversion of horizontal irradiance to the array plane and PV simulation. Following, a second post processing procedure is applied to adapt the forecasts for situations with snow cover on modules, where the original forecasts show a strong overestimation of the actual power production. This empirical approach is based on measured data of PV power production and additional ECMWF forecast parameters. Finally, regional forecasts are calculated by up-scaling the power production from a representative set of PV systems. The accuracy of the power forecasts has been evaluated for control areas of the German Transmission System operators. Depending on the size of the control areas, the RMSE values are in range of 3% to 4% of the installed nominal power for intra-day forecasts, and of 4% to 5% for day-ahead forecasts, respectively. In addition to the overall evaluation of the regional power forecasts we will show a detailed evaluation of irradiance and power forecasts for different weather situations.

A system of direct radiation forecasting based on numerical weather predictions

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For the prediction of the power supplied by a concentrating solar power (CSP) plant, in addition to the plant information, direct normal irradiation (DNI) predictions are needed. The only way of forecasting meteorological information for the next one or two days ahead is the use of numerical weather prediction models (NWPM). Nevertheless, DNI information is not derived from the NWPM, and intermediate calculations have to be made for DNI estimations. The first step of Cener's system consists in the use of Skiron NWPM. Skiron is running at CENER using GFS data as input and with a spatial resolution of 0.1°, hourly frequency and up to six days ahead. Skiron outputs of: downward shortwave radiation, temperature and pressure as well as cloud combination are used as inputs to a classification Support vector machine (SVM). This model is applied to decide the type of the predicted day. Depending of this prediction a clear sky model or a local nonlinear regression SVM are applied to generate the forecasts of direct radiation one day ahead. To generate the short term predictions, recent information from ground

data measurements (global radiation, temperature and pressure) as well as global radiation from satellite images are both used as input of a local nonlinear time series model. In this work the obtained results in CENER location (in the north of Spain) are shown. The CENER's BSRN station has been used to check the model results. At this moment, the system is focused in the optimization of hourly values prediction higher than 400 W/m2, due to these values are the most relevant in the CSP energy production. The worst results have been detected in the case of classification as sunny days when clouds really occur, in a 8% of the situations.

On the impact of model resolution and time frequency of outputs on renewable energy prediction

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Energy Sales and Markets "It is well known that horizontal and vertical resolution of the numerical weather prediction model as well as the choice of parameterization has a considerable impact on power prediction based on model outputs. In this study we aim at quantification of the improvement brought by the refinement of model resolution and output frequency for the specific case of our FOREG system operating on the domain of the Czech Republic. The system uses the outputs of the WRF model as inputs for statistical models predicting wind and photovoltaic power production. The present study is based on a WRF model simulation of four months for two nested domains with horizontal resolution 27 km and 3 km. Predictive ability of several model variables is investigated.

WRF-STAT coupled model for energy production forecasting from photovoltaic farms

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In this presentation we will show the state of our research in photovoltaic energy output modeling and prediction for a range of short time horizons. We will describe fundamentals of our approach that is based on coupling the numerical weather forecasting model (WRF) output in fine time and space resolution with a statistical model built specifically to calibrate the WRF output to the observed electrical energy outputs. We will explain the spatial integration procedure applied to the WRF output before statistical modeling. Then, we will explain the statistical model's structure. It is modular, reflecting several relevant WRF and time variables. The statistical calibration is built in a fully formalized way, using a semiparametric approach, to reflect empirically observed nonlinearity of the response. Its smoothness implied by internal complexity penalization increases efficiency of the estimation procedure. We will also demonstrate how time-varying model coefficients can rather dramatically improve the model performance and discuss practical implications of this finding in detail. We will also illustrate the performance of the full WRF-STAT coupled model on two large-scale photovoltaic farms.

EVA5

Contributed Session: Evaluation

Tuesday 28 June 3:45-5:15pm   Room: RB207

Chair: Adriaan Brebels

Prediction of Dengue Outbreak: Statistical Versus Machine Learning Techniques

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A dengue mathematical model is useful for the prediction of outbreak because it can act as an early warning system. However, such a model must be carefully parameterized and validated with entomological and weather data. A field study was conducted at 4 dengue prone areas in Malaysia. Ovitraps were placed outdoor to collect aedes larvae in each area for 87 weeks. Weather stations, consisting of a temperature and relative humidity data logger and an automated rain gauge were also installed at key locations in each study site to collect the weather data. Correlation and an Autoregressive Distributed Lag (ADL) model were used to study the relationship among the variables and leads to comparisons of techniques. Two statistical models (Autoregressive Distributed Lag (ADL) and Seemingly Unrelated Regression Equations (SURE)) were used to compare with Machine Learning Techniques (Neural Networks (NN) and Support Vector Machines (SVM)). The results showed that ADL was outperformed by NN and SVM but SURE outperformed the NN and SVM.

Modeling and forecasting the semiconductor industry cycles

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The paper focuses on the cyclical behaviour of the global semiconductor industry. Identifying and forecasting the stochastic processes governing semiconductor billings is relevant at a company and a macroeconomic level. Decision-makers of this high-tech industry need to assess the future trends and anticipate the turning points in order to adjust the timing of their capital and research investments. What's more the sector appears as a leading indicator of the world's economic health. There are, however, very few systematic studies of the semiconductor industry cycle today. Difficulty obtaining data relating to sales could explain that the first to establish models are market experts. The forecasting performance of a large number of models, which include both univariate and multivariate models are compared and contrasted in this paper. The monthly time series span the full period from January 1991 to August 2010, so our sample includes the crisis. The out-of-sample forecasts are evaluated using forecast statistics. After identifying the industry cycles and their properties thanks to algorithms such as the Hodrick-Prescott filter, we refer to fairly basic techniques. The univariate models used are random walk, moving average, exponentially smoothing, and autoregressive models. Then the study is enriched with other techniques which have varying degrees of complexity, for example a state space model is applied. Moreover, diverse indicators can impact fluctuations. Cycles could be explained in part by macroeconomic variables through the industrial production; specific industry factors as new orders, investments or inventories provide information about diverse aspects of the activity: demand, supply or price. Financial variables must also be taken into account as a proxy for anticipations of firms. A Vector AutoRegression model incorporates these explanatory factors. A Vector Error Correction Model is also used to anticipate the potential interactions at long term. The presence of structural breaks in some series suggests implementing specific methodologies.

Calculation method for the selection of the best scale- and domain-independent forecast model

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This paper presents a scale and domain independent method for determining the best forecast model among different. To choose the best model the accuracy need to be defined. Several commonly used scale independent forecast accuracy measures such as MAPE, sMAPE, MRAE, MASE were considered. A new scale independent integrated normalized calculation is presented based on the root mean square error (inRMSE). This inRMSE is used as criterion for classification of the different forecast models. This inRMSE is applied to 1) the same data for different forecasting method (one instance - many models); 2) the same forecasting model for different objects (many instances - one models/instance); 3) different forecasting models for different instances (many instances - many models/instance). The calculation method generates for the different forecasting models a conclusion over a period of time for different instances and uses weighted aggregation of data for the final decision. The calculation consists of 9 steps. The different steps can use different parameters for different domains and are flexible due to several adjustable parameters. For testing the calculation method we applied it to 3 different models of time-series forecasting: moving average, modified moving average and models based on neural networks. The naive model was used as a reference for the calculations. Data from 24 different instances (buildings) are taken from the energy consumption domain. The implementation, the results for the test instances and the recommendation for using this calculation method to compare time-series forecasting models are presented and discussed in the conclusions of the paper. The main conclusion is that our method can clearly discriminate between different forecasting models.

Averaging and Private Information as Drivers of Prediction Market Accuracy

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Prediction markets are seen as a powerful instrument to retrieve collective forecasts. Recently, we conducted experiments that showed prediction markets can aggregate dispersed information accurately. However, under equal conditions especially regarding information level, a survey worked as accurate as two different prediction market designs. We hypothesized that the absence of privately held information could be responsible for a lack of differences between prediction markets and survey results. In subsequent experiments we provided participants with different private information. But like the experiments before: while the forecasts of prediction markets were quite accurate, so too were those from a group partaking in a survey. No statistically significant difference could be found between prediction markets and surveys. We explain these surprising results with the different and differently strong effects of averaging (i.e. cancelling out of errors) and private information on the accuracy of collective forecasting instruments. A model will be presented at the conference encompassing both effects as causal factors of prediction accuracy. Other factors are the number of participants, frequency and values of predictions and correlations in between. According to this model, it seems to be, that averaging normally overshadows weaker informational effects. Private information needs to be leading to "heavy" trading behaviour either in number or value to change the average market price in a prediction market. If participants do not act strongly on their conviction of what is a "wrong" market price in their perception, the market price will not change. On the other hand, if too many predict in the same way, speculative bubbles and herding behaviour can arise.

ECO4

Contributed Session: Econometrics

Tuesday 28 June 3:45-5:15pm   Room: RB209

Chair: Neil Ericsson

Forecasting Mixed Frequency Time Series with ECM-MIDAS Models

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This paper proposes a mixed-frequency error-correction model in order to develop a regression approach for non-stationary variables sampled at different frequencies that are possibly cointegrated. We show that the choice of the timing between the low-frequency dependent and the high-frequency explanatory variables to be included in the long-run has an impact on the remaining dynamics and on the forecasting properties. Then, we compare in a set of Monte Carlo experiments the forecasting performances of the low frequency aggregated model and several mixed-frequency regressions. In particular, we look at both the unrestricted mixed-frequency model and at a more parsimonious MIDAS regression. Whilst the existing literature has only investigated the potential improvements of the MIDAS framework for stationary time series, our study emphasizes the need to include the relevant cointegrating vectors in the non-stationary case. Furthermore, it is illustrated that the exact timing of the long-run relationship matters in small samples, but the sensitivity of the forecasting performance to this kind of misspecification is lower than to the exclusion of the disequilibrium error. Finally, the unrestricted model is shown to suffer from parameter proliferation for small sample sizes whereas MIDAS forecasts are robust to over-parameterization. Two empirical applications illustrate the theoretical and the Monte Carlo results. In both cases the use of MIDAS leads to a substantial improvement in the RMSE when compared to the unrestricted framework.

Forecasting interval data with probabilistically constrained regression models

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We propose a constrained regression model for interval-valued data, either time series or cross-sectional, that guarantees that the lower bound of the predicted interval is always smaller than its upper bound. We specify a general bivariate system for the upper and lower bounds of the intervals with restrictions on the bivariate probability density function of the vector of errors. Though estimation by maximum likelihood (ML) is possible, it is computationally burdensome as multiple local maxima limits the reliability of the estimator in practice. As an alternative to ML, we propose a two-step procedure that delivers estimators with optimal asymptotic properties whether the restriction is binding or not. Monte Carlo simulations show good finite sample properties of the estimators. We provide an application with time series data to forecast the low/high interval of several financial assets based on a general VAR with probabilistic restrictions.

Forecasting U.S. Macroeconomic and Financial Time Series with Noncausal and Causal AR Models: A Comp

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In this paper, we compare the forecasting performance of univariate noncausal and conventional causal autoregressive models using a large data set of the U.S. macroeconomic and financial time series. In contrast to the causal AR model, the noncausal model also allows for dependence on the future. For a comprehensive data set consisting of 170 monthly U.S. macroeconomic and financial time series, the noncausal AR models consistently outperform the causal models in terms of the mean square and mean absolute forecast errors. In particular, at the three and six-month forecast horizons noncausal models yield smaller forecast errors for variables related to employment, construction, price indices and wages, whereas for interest rates and asset prices, the noncausal model does not seem to bring extra benefit. As many important macroeconomic time series, such as the real-GDP and its components, are measured only on a quarterly basis also the comparisons of quarterly forecasts are of interest. Thus, in addition to the monthly data, we consider 18 central quarterly U.S. macroeconomic time series. For the quarterly time series, the improvement in forecast accuracy due to allowing for noncausality is found even greater compared with the results for the monthly time series.

Assessing Global Vector Autoregressions for Forecasting

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Global vector autoregressions (GVARs) have several attractive features: a standardized economically appealing choice of variables for each country or region examined a systematic treatment of long-run properties through cointegration analysis, and flexible dynamic specification through vector error correction modeling. Pesaran, Schuermann, and Smith (2009, International Journal of Forecasting) generate and evaluate forecasts from a paradigm GVAR with 26 countries, based on Dees, di Mauro, Pesaran, and Smith (2007, Journal of Applied

Econometrics). The current paper empirically assesses that GVAR with impulse indicator saturation (IIS), a new generic procedure for evaluating parameter constancy---a central element in model-based forecasting. The results indicate substantial room for an improved, more robust specification of that GVAR, with some tests suggestive of how to achieve such improvements.

FM3

Contributed Session: Forecasting Methods

Tuesday 28 June 3:45-5:15pm   Room: RB210

Chair: Alfredo Garcia-Hiernaux

Volatility Forecasting Based on Price Return and High-low Price Range

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In this paper, volatility estimators incorporating the information provided by price return and high-low range are proposed. Two specifications of the conditional variance of the proposed range-augmented GARCH (RGARCH) model are demonstrated to have better volatility estimation and forecasting capability than three benchmarks, the GARCH, EGARCH, and GJR-GARCH models. In addition, a dynamic bias correction component for the biased volatility estimator of high-low range also can be extracted through the proposed approach.

Model selection versus model averaging for forecasting economic time series

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This paper asks whether it is advantageous to pick one particular model among many different candidate models according to some specific model selection criteria when the aim is to forecast one variable into the future. In particular, I concentrate on the specification of autoregressive distributed lag models. Such models are frequently applied in macroeconomic forecasting problems. Due to recent advances in model combination and its success in terms of forecasting performance, model averaging can be generally seen as an alternative to selecting one particular model, i.e. the specification of the exact lag lengths of explanatory variables. In this paper I consider standard model selection strategies based on sequential elimination of lags (general-to-specific), a specific-to-general strategy and sequential strategies based on information criteria. Furthermore, I use pooling techniques that consider various models and outcomes based on the respective forecasting performance. I choose simple weighting schemes such as the mean as well as weighting schemes based on the proposed information criteria as well as Bayesian techniques. I

find that sequential model selection strategies mostly fail in uncovering the true model for sample sizes typically used in applied macroeconomics. Second, the differences among the various selection criteria are found to be small. Generally, a general-to-specific and the modified Akaike criterion (AICC) provide the most accurate results. Third, model averaging schemes provide clear improvements in terms of forecasting accuracy. Often the equal weighting scheme provides better results than combinations based on information criteria. In a real time application for German GDP using the ifo climate index I further document the relevance of model averaging compared to model selection. Generally, the main finding of this study is that due to model uncertainties averaging of all possible models is advantageous in terms of forecasting accuracy even when the data generating process is stable over time.

Dynamic Model Selection and Combination in Forecasting: an Empirical Evaluation of Bagging and Boosting

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In forecasting a large number of time series, research remains inconclusive on how to best deal with model selection. Best practices in statistical research suggest selecting a single model by information criteria (e.g. AIC) using 1-step-ahead in-sample errors. Simultaneously, evidence from the popular M-Competitions suggests that model combinations can outperform the selection of individual models (with the ensuing discussion on how to best combine models). Despite their discrepancies, both approaches share that a set of candidate forecasting models is first computed, and then one/multiple/all models are selected ex post, after each model is parameterised. In contrast, in machine learning predictive models are regularly combined in a dynamic way, using Boosting and Bagging to perturb, reweight and resample the training data during the parameterisation process. Despite their ubiquitous application in classification, only limited research has assessed their efficacy on time series data, and the few studies show substantial shortcomings in the empirical evaluation. Of the 15 publications on Boosting on time series data, only 5 assess accuracy on empirical time series, none evaluate more than 11 series across a single time origin, and none provide a comparison against simple model combination or other ensemble methods. Consequently, the empirical accuracy of boosting and bagging, relative to model selection or combination, has not been properly assessed for time series data. To close this gap, we conduct experiments on the relative accuracy of the dynamic models of Bagging and two Boosting variants, AdaBoost.R2 and AdaBoost.RT, in comparison to conventional ex-post approaches of model selection and forecast combination, and statistical benchmarks of the Random Walk, Seasonal Random Walk and Exponential Smoothing. We adopt best-practices, comparing multiple robust error measures (sMAPE, ranks of MAE, etc.) of multiple-step-ahead predictions across rolling time origins, using 111 monthly industry time series from the NN3 forecasting competition. Results are analysed by time series length (long vs. short), time series pattern (seasonal vs. non-;seasonal) and forecasting horizon (long vs. short) to assess the conditions under which a method performs well. Results show that bagging and boosting consistently outperform model selection and model averaging.

Prediction with subspace methods: Some different alternatives

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Subspace methods are widely employed in some fields like engineering and physics and have been recently adapted to some characteristics of the economic and financial data. In comparison with mainstream time-series analysis (Box and Jenkins, 1976), they are flexible, as univariate and multivariate cases are treated in the same way, and fast, as iterations are not required. Consequently, they are a very interesting alternative to conventional forecasting tools such as vector autoregression (VAR) models. Despite the extensive literature about their statistical properties and their increasing empirical uses, forecasting with subspace methods is still a quite unexplored issue. To the best of my knowledge, the scarce references usually use a state-space model estimated with these techniques to extrapolate, but do not take advantage of some subspace properties that can be used to improve the forecasts. This research examines the one-step and multi-step-ahead out-of-sample forecasting properties of subspace methods and suggests different procedures based on combining multiple forecasts, obtained from setting a range of values for a specific parameter that is typically fixed by the user in the subspace literature. In order to enhance the multi-step-ahead predictions, modified direct and iterated multi-step forecasts are built. The procedures proposed are compared against appropriate alternatives and tested in an extensive Monte Carlo experiment and with real data.

Invited session: High-Frequency Macroeconomic Forecasting

Tuesday 28 June 3:45-5:15pm   Room: RB211

Chair: Rosa Ruggeri Cannata

Measuring Inflation Expectations Using Interval-Coded Data

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To quantify qualitative survey data, the Carlson–Parkin method assumes normality, a time-invariant symmetric indifference interval, and long-run unbiased expectations. Interval-coded data do not require these assumptions. Since April 2004, the Monthly Consumer Confidence Survey in Japan asks households their price expectations a year ahead in seven categories with partially known boundaries; thus one can identify up to six parameters including an indifference interval each month. This paper compares normal, skew normal and skew t distributions, and finds that the skew t distribution fits the best throughout the period studied. The results help to understand the dynamics of heterogeneous expectations.

Nowcasting Inflation Using High Frequency Data

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This paper proposes a methodology to nowcast and forecast euro area inflation using data with sampling frequency higher than monthly. The nowcasting literature has been focused on GDP, typically using monthly indicators in order to produce an accurate estimate for the current and next quarter. This paper exploits data with weekly and daily frequency in order to produce more accurate estimates of HICP inflation for the current month and followings months. In particular, this paper uses Weekly Oil Bulletin Price Statistics of the European Commission and daily World Market Prices of Raw Materials, produced by the European Central Bank. The data are modelled as a high frequency factor model with missing observations in a state space representation. For the estimation we adopt the methodology of Banbura and Modugno (2010). In contrast to other existing approaches, the methodology used in this paper has the advantage of modelling all data within a unified single framework that, nevertheless, allows one to produce forecasts of all variables involved. This offers the advantage of disentangling a model-based measure of "news" from each data release and subsequently to assess its impact on the forecast revision. The paper provides an illustrative example of this procedure. Moreover this paper shows that both the weekly oil bulletin and raw material prices are useful to improve the accuracy of overall HICP inflation forecasts. This is due to the higher accuracy in the forecasting performance of the HICP energy inflation.

A euro area monthly indicator of employment: a dynamic factor modelling approach

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The paper presents results of indirect estimation of a monthly indicator of employment for the euro area. The implemented approach is based on a mixed-frequency dynamic factor model of quarterly employment which is temporally disaggregated through a set of monthly related series among which unemployment and labour input data. The information set consists of data officially released by Eurostat and takes into account the split of the economy into the 6 NACE sections of economic activity. Several model configurations are discussed with an extensive comparison of results, including setups of small and medium size and the alternative specification in levels and logarithms. The largest multivariate setups are estimated through the EM algorithm. The proposed modelling approach is in line with that of Euro-MIND, the Eurostat monthly indicator of economic activity based on real GDP, with the advantage to provide comparable measures for employment.

EuroMIND: a monthly for Euro Area economic activity

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EuroMIND is a monthly indicator of economic activity for the Euro Area. It provides an estimate of GDP based on temporal disaggregation of quarterly national accounts estimates, within a set of linked medium-size dynamic factor models for a set of coincident indicators. The main EuroMIND features are: first it considers both the output and the expenditure sides of GDP, combining the two estimates with optimal weights; second, monthly and quarterly information is modelled in a unique state-space setup; third, it pays attention to computational efficiency, implementing univariate filtering and smoothing procedures; finally, chain linking and its implications is taken into account. From its original development EuroMIND has been extended over several directions: EuroMIND-S, which includes business survey indicators modelled by a separate factor for improving now-casting properties; EuroMIND-C, which extends the estimates to some member states, on the base of a parametric large scale factor model handling

a large set of time series with mixed frequency; moreover, a novel state space representation is adopted for a dynamic factor model which models jointly the series for the countries and the sectors. EuroMIND-C aims not only to provide monthly information at country level, but also to enhance the overall quality of the Euro Aare indicator. EuroMIND-B calculating estimates over the historical period starting from January 1971; and EuroMIND-G which aims at providing an estimate of potential output and output gap for the Euro area. This paper presents the main methodological developments related to these extensions. It presents comparative results in real time between EuroMIND, EuroMIND-C and EuroMIND-S; furthermore, it addresses the main issues dealt with when producing back-casted EuroMIND data and when deriving output gap estimates, especially during the recent global financial and economic crisis.

Invited session: Forecasting Support Systems

Tuesday 28 June 3:45-5:15pm   Room: RB213

Chair: Paul Goodwin

New developments in software support for operational forecasting

Panel members:
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Forecasting software used to support operational forecasting generally lags behind the research frontier. Sometimes the reasons are commercial, sometimes it is the new ideas are ineffective or are not economically valuable. This panel discussion includes two of the major suppliers of commercial software (Stellwagen, Leonard) as well as a developer of developmental software (Crone). Joining the panel from a different perspective is Michael Lawrence who has for much of his academic life, examined software use and here he will consider the inclusion of tools to enable forecasters to monitor and improve the adjustments they make to the forecasts that are so often ineffective. The brief of the panel is to discuss what they see as the latest developments across the industry and comment on desirable improvements for users and the barriers they see to such innovations.

Plenary Session: Keynote Speech
Clive Granger Keynote Address

Wednesday, 29 June, 8:30am-9:30am   Room: RB101

Chair: Michael Clements, Warwick University, United Kingdom

Measuring Connectedness in a Connected World

Francis Diebold

University of Pennsylvania, USA

"Connectedness" is crucially important in financial and macroeconomic forecasting. The Great Crisis of 2007-2009 is just one reminder, with countless ancestors and progeny, yet the connections that caused it remain poorly understood. Against this background, I propose a simple yet powerful framework for measuring connectedness, and I apply it in several contexts of interest, ranging from connectedness of individual financial firms, to connectedness of financial markets, to connectedness of country business cycles. The connectedness measure involves variance decompositions of vector autoregressions, which form weighted, directed networks, bringing us in close touch with ideas and tools from modern network analysis.

Francis X. Diebold is Paul F. and Warren S. Miller Professor of Economics, Professor of Finance and Statistics, and Co-Director of the Financial Institutions Center at the University of Pennsylvania and its Wharton School, as well as Faculty Research Associate at the National Bureau of Economic Research in Cambridge, Mass. He is currently president-elect of the Society for Financial Econometrics. Diebold has published extensively in econometrics, forecasting, finance and macroeconomics, and he has served on the editorial boards of numerous journals, from Econometrica to Journal of Portfolio Management. He is an elected Fellow of the Econometric Society and the American Statistical Association, and the recipient of Sloan, Guggenheim, and Humboldt fellowships. He is a founding member of the Oliver Wyman Institute, a cooperative undertaking between Oliver Wyman and the international academic community, whose mission is to facilitate and accelerate knowledge transfer between academia and the financial services industry. Diebold lectures actively, worldwide, and has received several prizes for outstanding teaching. He has held visiting appointments in Economics and Finance at Princeton University, Cambridge University, the University of Chicago, the London School of Economics, Johns Hopkins University, and New York University. During1986-1989 he served as an economist under Paul Volcker and Alan Greenspan at the Board of Governors of the Federal Reserve System in Washington DC, and during 2007-2008 he served as an Executive Director at Morgan Stanley Investment Management. He received his B.S. from the Wharton School in 1981 and his Ph.D. in 1986, also from the University of Pennsylvania. He is married with three children and lives in suburban Philadelphia.

Invited session: Singular Spectrum Analysis II

Chair: Hossein Hassani

Cross Country Analysis of Industrial Production Using Multivariate Singular Analysis (MSSA)

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In recent years the Singular Spectrum Analysis technique has been further developed and applied to many practical problems. The aim of this research is to extend and apply the SSA method for cross country analysis of industrial production data. The performance of the SSA and multivariate SSA (MSSA) techniques assessed by applying it to 24 time series measuring the monthly seasonally unadjusted industrial production for the main sectors of the UK, France and German economy. We introduce several criteria which test a causal relationship between two time series based on the SSA technique. These criteria and tests are based on the forecasting accuracy and the predictability of the direction of change. The proposed test are then applied and examined using the industrial production data.

On the Globalization of Stock Markets: An Application of VECM, SSA and Mutual Information to the G7 Singular Spectrum Analysis

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This paper analyzes the process of stock market globalization on the basis of two different approaches: (i) the linear one based on cointegration tests and vector error correction model (VECM); and (ii) the nonlinear approach based

on Singular Spectrum Analysis (SSA) and mutual information tests. While the cointegration tests are based on regression models and typically capture linearities in the data, mutual information and SSA are well suited for capturing global non-parametric relationships in the data without imposing any structure or restriction on the model. The theoretical background is rooted on a new concept of weak market integration, which is defined as the extent of causality that occurs in price transmission independently of whether this process is proportional or not over time. The data used in our empirical analysis were drawn from DataStream and comprise the natural logarithms of relative stock market indexes since 1973 for the G7 countries. The main results point to the conclusion that significant causal effects occur in this context and that mutual information and the global correlation coefficient actually provide more information on this process than VECM, but the direction of causality is difficult to distinguish in the former case. In this field, SSA shows some advantages, since it enabled us to capture the nonlinear causality in both directions. There is evidence that stock markets are closely related in the long-run over the 36 years analyzed and, in this sense, one may say that they are globalized.

A multi-country prosperity index by two-dimension singular spectrum analysis

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With the development of the global economy, interaction among different economic entities from one region is intensifying, which makes it significant to consider such interaction when constructing composite index for each country from one region. Recent advances in signal extraction algorithm and time series modeling technique makes such consideration not only feasible but also practical. Singular spectrum analysis (SSA) is a newly developed tool for time series modeling and proven to be a powerful tool in extracting signals. In this paper, this method is introduced into multi-country business cycle analysis for the first time. MSSA is employed to construct a model-based composite index and the 2D-SSA is used to establish the multi-country composite index. Empirical results performed on Chinese economy demonstrate the accuracy and stability of MSSA-based composite index, and the 2D-SSA based composite indexes for Asia countries show their efficiency in capturing the interaction among different countries.

A Comparative Study of FFT-ARMA and SSA-ARMA approaches to forecast daily maximum ambient O3 Concentrations

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In this study, daily maximum O3 concentrations time series from 1-May-1996 to 30-Sep-2007 for an urban site of London (Brent) has been analyzed by two statistical modelling approaches. In the first approach called by FFT-ARMA, Fast Fourier Transform (FFT) has been used to model the periodicities (annual periodicity is especially

distinct) exhibited by the time series. Based on power-spectrum characteristics, the first three predominant frequencies have been selected to model the FFT-component of the time series. The residuals of actual data subtracted with their corresponding FFT component exhibited stationarity and have been modelled using ARMA (Autoregressive Moving Average) process. In the second approach, called by SSA-ARMA, Singular Spectrum Analysis (SSA) has been used to extract the different structural components of the time series. First five principal components have been selected which mimic the trends and the periodicities of the time series. These have been modelled based upon their structure (linear trend or sinusoidal behaviour) and together their sum is called as SSA component. The actual data subtracted with their SSA component was modelled using ARMA process. The performances of both of the FFT-ARMA and SSA-ARMA approaches were evaluated for 30 out of sample forecasts for 1-day ahead, 2-day ahead, 3-day ahead, 4-day ahead and 5-day ahead forecasts. The statistical indicators such as MAE (mean absolute error), RMSE (root mean square error), MAPE (mean absolute percentage error) indicates that FFT-ARMA forecasts and SSA-ARMA forecasts remain comparative for short-term (1-day ahead) but SSA-ARMA clearly outperforms FFT-ARMA as the forecast horizon increases (i.e., for 2-day ahead, 3-day ahead, 4-day ahead and 5-day ahead forecasts).

Comparison between Present and Ancient Climate Structures by using SSA

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Change-point detection is an interesting research topic for data-mining and is based on singular spectrum analysis (SSA). In this study, this method is applied to Kenyan monthly precipitation data in the twentieth century and lake sediment data corresponding to a time span in the Holocene. The sediment data are considered to be representative for the rainfall variability at those ancient times. The goal is to discuss each structural transition of trend, periodic and stochastic parts extracted from the two different kinds of data sets. In this way one can find changes in the structure of precipitation from present compared to early Holocene paleoclimate.

Invited session: Financial Time Series

Wednesday 29 June 9:40-10:40am   Room: RB210

Chair: Manabu Asai

Multivariate volatility modelling of electricity futures

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The deregulation of European electricity markets has led to an increasing need in understanding the volatility and correlation structure of electricity prices. We model a multivariate futures series of the European Energy Exchange (EEX) index, using an asymmetric GARCH model for volatilities and augmented dynamic conditional correlation (DCC) models for correlations. In particular, we allow for smooth changes in the unconditional volatilities and correlations through a multiplicative component that we estimate non-parametrically. We also introduce exogenous variables in our new multiplicative DCC model to account for congestion in short-term conditional volatilities. We find different correlation dynamics for long and short-term contracts and the new model achieves higher forecasting performance compared to a standard DCC model.

Forecasting Volatility Using Range Data: Analysis for Emerging Equity Markets in Latin America

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The paper suggests a simple but effective approach for estimating value-at-risk thresholds using range data, working with the filtered historical simulation. We propose asymmetric heterogeneous ARMA model for log-range, which captures the leverage effects and the effects from daily, weekly and monthly horizons. The empirical analysis on

stock market indices on US, Mexico, Brazil and Argentina shows that 1% and 5% VaR thresholds based on one-step-ahead forecasts of log-range are satisfactory for the period includes the global financial crisis.

Continuous Time Dynamic Correlation Model

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The paper proposes a continuous-time fractionally integrated Wishart process. Based on the long memory and short memory Wishart processes, the paper develops new dynamic correlations (DC) diffusion process. The paper shows that the invariant distributions of the new DC processes are Wishart distributions. The paper specifies the continuous-time multivariate stochastic volatility (MSV) models, using the recent empirical findings. The paper also discusses the statistical inference for the continuous-time MSV models.

ENR3

Contributed Session: Energy

Chair: Nigel Mead**e**

Forecasting micro-generation technology with no data: an application of discrete choice analysis

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As the costs of oil and gas increase and political situation become increasingly volatile the provision of electrical power by fossil fuels becomes less attractive. The carbon emissions of fossil fuels exert extra pressure to adopt power generation by alternative technologies. The advantages of renewable energy technologies are reduced carbon emissions and reduced usage of fossil fuels. Here we study the consumer preference to adopt micro-generation technologies, specifically, solar photo-voltaic (PV) cells for household level electricity generation. We use stated preference approach of discrete choice analysis to elicit consumer preferences for different features of technology. We also use time intent questions to elicit possible adoption time probabilities. We then combine consumer preference for technology features to time intent adoption probabilities to make forecasts for solar PV cells using innovation diffusion framework.

Fuzzy Logic Approach for Forecasting Half-Hourly Malaysian Electricity Load Demand

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Successful electricity load demand forecasting is not just about making simple extrapolation of historical load pattern into the future but it involved a process. Practicing forecasters recognize that their job do not end once the technique has been selected and forecast generated. In fact, it has just begun and they need to continuously check actual results against forecasted magnitudes, to analyse forecast error pattern, and to reevaluate the underlying forecasting methodology when the error analysis suggests that the forecasting model is flawed. In Malaysia, a national electricity company is responsible for the generation and distribution of electricity with the capacity of over 13K MW. A review on the current practices of forecasting is conducted at TNB to understand the need of forecasting functions, its role and its limitation. A forecasting model is used which identifies seasonal factors in the time-series and seasonality often accounts for the major part of time series data. In this paper we explore the used of Fuzzy Logic for forecasting half hourly electricity demand. The day to be forecast include normal working day as well as weekend and holidays due to the different of energy load behavior. In solving short term load forecasting, the current and historical data of temperature and load has been used to develop the rules. This study compares two defuzzification methods (COA and MOM). The result show fuzzy approach was simple to use and give better performance when compared to time series used.

The growing international contribution of renewable energy technologies to electricity generation

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We model and forecast the growing contribution of renewable energy technologies (RETs) to electricity generation. The RETs we consider are wind turbines, solar cells and biomass. In contrast to most industrial technological innovations there is not a straightforward economic advantage flowing from the new technology. Generation of electricity by a renewable energy technology is generally more expensive and less convenient than the current technology. The advantages of RETs are reduced carbon emissions and reduced usage of fossil fuels. This means that the usage of the technology is linked with the pricing of the environmental benefits of RETs via incentive schemes, other regulatory stimuli and exposure to the costs of fossil fuels. The model uses a multi-country framework, where the dependent variable is electricity generated by each renewable technology in each country considered. The model is developed using EU data.

EBC10

Contributed Session: Economics and Business Cycles

Wednesday 29 June 9:40-10:40am   Room: RB212

Chair: Michael Clements

Coincident and Leading indicators using Factor Linear Dynamic Harmonic Regression Models

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One strand of growing interest within the multivariate literature consists in examining how the size and the composition of the data affect the forecasting performance. In several recent papers it was found that expanding the sample size simply by adding data that bear little information about the factor components does not necessarily improve forecasts and, when the data are too noisy, we can be better off by throwing away some data even though they are available. Our goal in this paper is to obtain Composite Coincident (CCI) and Leading (CLI) indicators for the Spanish economy using monthly targeted predictors (cycle drivers) and dynamic factor models. The usefulness of the new indicators have been checked through both historical behavior and out-of-sample forecasting performance. When using the whole sample our CLI systematically anticipates the peaks and troughs of both the GDP growth cycles as well as the industrial production classical cycles with considerable anticipation. On the other hand, the use of our CLI provides considerable aid in forecasting annual and quarterly GDP growth rates during the recent recession. Using only real data available at the beginning of each forecast period our leading indicator one-step forecasts shows considerable improvements over other benchmark alternatives including panels of consensus forecasts. Given the shortcomings of GDP in representing present economic conditions, our CCI takes into account the latest monthly information and provides a more accurate account of the general business conditions.

Do Professional Forecasters Pay Attention to Data Releases?

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We present a novel approach to assessing the attentiveness of professional forecasters to news about the macroeconomy. We find evidence that professional forecasters, taken as a group, do not always update their estimates of the current state of the economy to reflect the latest releases of revised estimates of key data.

BAY1

Contributed Session: Bayesian Methods

Wednesday 29 June 9:40-10:40am   Room: RB213

Chair: Inga Maslova

Bayesian Learning Regression and Wavelet Approach to Forecast River Volume in Peru using El Niño-Southern Oscillation Index

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This research presents a novel methodology to forecast monthly river volume in Peru. It is based on Bayesian learning regression and wavelet decomposition. The inputs of the model utilize past information of river volume; past and predicted conditions of El Niño-Southern Oscillation (ENSO) indicator (sea surface temperature). The inputs are decomposed into meaningful components formulated in terms of wavelet multiresolution analysis (MRA). The outputs are the forecasts of river volume two, four and six months ahead. The forecasting is performed using the Multivariate Relevance Vector Machine (MVRVM), which is based on Bayesian regression approach. Test results show that the Wavelet-MVRVM model learns the input-output patterns with high accuracy. A bootstrap analysis is used to evaluate robustness of model parameter estimation. The importance of this study lies in its ability to understand the impact of ENSO on a river basin in Peru. The Wavelet-MVRVM is superior compared to a MVRVM, in terms of performance and robustness.

BVARs forecasting Colombian Inflation

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This paper presents the results of the estimation and forecasting of the Colombian Inflation through several Bayesian VAR (BVAR), which use information on Colombian Consumer Prices, Gross Domestic Product, an Interest Rate, a Money Aggregate as well as other local and foreign variables. The forecast accuracy of several tried s7pecifications

and prior is evaluated using a multi-variate and multi-horizont criteria. After that, for each selected specification of the BVAR, the forecast of annual Inflation rates are compared against those of an univariate random walk, and against frequentist VARs. Results show that BVARs achieve improvements up to of 65.4% in RMSE relative to the frequentist VAR.

Commodity Price Modeling and Forecasting Using Wavelet and Bayesian Machine Learning Regression

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We propose a novel approach based on wavelet and Bayesian regression techniques to analyze, model and forecast non-stationary U.S. agricultural commodity prices one, two, three, and four weeks ahead. The wavelet-based multiresolution analysis (MRA) is used to examine the prices in both time and frequency domain. In order to improve the model performance the time series of the agricultural commodities are decomposed into meaningful components formulated in terms of wavelet MRA. The model and forecasts are obtained using the Multivariate Relevance Vector Machine (MVRVM), which is based on Bayesian machine learning regression. A bootstrap analysis is used to evaluate the robustness of the model parameter estimation. The proposed hybrid Wavelet-MVRVM model has proved to be more accurate and robust compared to classical time series and MVRVM models developed in previous studies. This superior price modeling and forecasting methodology would enable better decision making and managing price risk.

SSM1

Contributed Session: State Space Models

Wednesday 29 June 11:00am-12:30pm   Room: RB206

Chair: Gael Martin

The effects of disaggregation on forecasting nonstationary time series: an unobserved components application

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This paper focuses on the effects of disaggregation on forecast accuracy for nonstationary time series using unobserved components models. We consider both unrelated and common trends. Although the basic theoretical results are known for stationary vector ARMA time series, the possibility of cointegration, or equivalently the presence of common trends, brings a new dimension to this problem. The use of unobserved components models allows the possibility of explicitly modeling the trends. We study the presence of common trends among several components using a dynamic factor model. We compare the forecasts obtained directly from the aggregated series based on its univariate model with the aggregation of the forecasts obtained for each component of the aggregate. Within this late framework (first obtain the forecasts for the component series and then aggregate the forecasts), we try two different approaches: (i) generate forecasts from a multivariate model and (ii) generate the forecasts from univariate models for each component of the aggregate. We give analytical conditions for the equality of forecasts. In the case of common trends, we have also obtained that the forecast equality between the factor model and the univariate analysis of the aggregate cannot be achieved if the aggregation vector is a cointegrating vector. The results are applied to quarterly Gross Domestic Product (GDP) data of several European countries of the euro area and to their aggregated GDP. Decisions of political economy are based on macroeconomic variables both at the country level and on its aggregates. We will make forecasts at the country level and then pool them to obtain the forecast of the aggregate. This will be compared to the prediction obtained directly from modeling and forecasting the aggregated GDP of these European countries.

Measuring the uncertainty of misspecified unobserved components

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In the context of time series analysis, the Kalman filter is a very powerful tool to estimate and construct prediction intervals of underlying components of interest as common factors, trends, time-varying parameters etc. However, running the Kalman filter requires knowledge of the true specification and parameters of the unobserved component model. This is very unrealistic situation as both the specification and the parameters are often unknown. Consequently, the Kalman filter Prediction Mean Squared Errors (PMSE) associated with the estimated unobserved components are biased, and therefore, prediction intervals may be inaccurate because they do not incorporate the uncertainty caused by parameter estimations and the misspecified problem. This paper has two contributions. First, we measure the biases attributed to model misspecification in two different contexts. First, we consider the biases when measuring the uncertainty associated with the underlying trend estimated by running the Integrated Random Walk when the trend has been generated by a Random Walk plus drift model. Secondly, we consider the biases incurred when the underlying level of the Local Level Model is estimated by assuming homoscedasticity when the true model is conditionally heteroscedastic. The second contribution of this paper is to show that traditional bootstrap procedures designed to obtain the PMSE and then prediction intervals in the presence of parameter uncertainty are not able to cope with model misspecification

Distribution Based Level Change Detection in a Random Level Forecasting Model

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Identifying the existence of level change is necessary in order to understand the significance of causal events and produce accurate forecasts. To detect level change, the relevant statistics have been suggested in forecasting literature. However, their focuses are to measure the degree of errors caused by level change. Since the statistical distributions of those statistics were not derived so far, forecasters could not use them in the hypothesis test of level changes, but merely use them in an ad-hoc way. Our study aims to test level change in a rigorous way and to reduce forecast error by finding a statistical distribution to the given statistic and elaborating the forecasting equation in an adaptive manner. We derive the statistic based on the state space model with level change used by Jun (1989), and the distribution is generated by a simulation method. The performance of the proposed method is validated by simulated time series, and its practical application is provided by applying it to a Korean macroeconomic time series. Based on the simulation and empirical analysis, we conclude that the proposed approach reduces forecast errors of the time series that are exposed to significant level changes frequently.

Non-Parametric Estimation of Forecast Distributions in Non-Gaussian State Space Models

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The object of this paper is to produce non-parametric maximum likelihood estimates of forecast distributions, in a general non-Gaussian, non-linear state space setting. The transition densities that define the evolution of the dynamic state process are represented in closed parametric form, but the conditional distribution of the non-Gaussian variable is estimated non-parametrically. The requisite recursive filtering and prediction distributions are estimated via an algorithm that is closed-form up to the solution of one- (or two-) dimensional integrals at each time point, defined only over the standardized support of the measurement error. Standard deterministic integration is then used to estimate the relevant integrals. The method is illustrated using a variety of models, with simulation experiments used to document the accuracy of the non-parametric method relative to both correctly and incorrectly specified parametric alternatives. In an empirical illustration, the method is used to produce sequential estimates of the forecast distribution of realized volatility during the recent financial crisis.

Contributed Session: Finance

Wednesday 29 June 11:00am-12:30pm   Room: RB210

Chair: Angi Roesch

A Method to Overcome the Random Walk Dilemma in Financial Forecasting

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A wide number of linear and non-linear models have been proposed in the literature to solve the financial forecasting problem. However, a limitation arises from all these models and is known as the random walk dilemma. In this scenario, forecasts generated by these models present a delay of one step ahead with respect to the series values. In this paper, we propose a suitable method inspired by concepts in mathematical morphology (MM), lattice theory (LT) and evolutionary computation (EC). This method is generically called the evolutionary-lattice-morphological (ELM). It consists of a hybrid method composed of a dilation-erosion perceptron (DEP) with a covariance matrix adaptation evolutionary strategy (CMAES), which searches for close-to-optimal time lags to rebuild financial phenomena, as well as determines the initial (sub-optimal) parameters of the DEP. Each individual of the CMAES population is further trained using the back propagation (BP) algorithm with automatic phase fix procedure (APFP), which is geared toward eliminating the one step delay that occur in financial forecasting. Furthermore, an experimental analysis is conducted with the proposed ELM method using four complex non-linear problems of financial time series forecasting, and the obtained results are discussed and compared to classical results found with random walk models.

Risk Modelling for Agricultural Commodity Prices

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We propose return volatility models for three agricultural commodities; namely, rough rice, rubber and white sugar. We investigate the presence of mean reversion and consider different patterns of seasonality in mean return and volatility (GARCH is used to capture volatility clustering). Patterns of seasonality include a day-of-the-week effect (representing investor behaviour) and a yearly effect due to the harvest. We find that seasonal patterns dominate in the estimation of volatility – both GARCH with seasonality in mean and GARCH with seasonality in mean and volatility. We find that the inclusion of seasonality is crucial in providing more realistic volatility models for agricultural products. We find no evidence of mean reversion in our samples. In addition, we also investigate the use of several error distributions: Gaussian, Student-t and the Generalized error distribution (GED) in order to

capture the high kurtosis found in the data. We compare the forecasting performances of the proposed models using Value-at-Risk to evaluate the relative accuracy of these models.

Forecasting the hedge ratio in commodities' and agricultural futures markets: Evidence from GARCH Mo

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Trader use futures market for either price discovery or hedging risk. Voluminous futures' trading is used to reduce and transfer risk in futures market by substituting for a cash market transaction. Accurate forecasting of hedge ratio is important for investors when they are planning and making decision on investment. Agricultural and commodities' futures trading make up to 11 percent in futures market. However, the two markets are not well studied by prior scholars because of high price volatility of agricultural products and commodities. To our knowledge, very few studies investigate the forecasting of HR in the commodity and agricultural futures markets. In this paper we study the predictive power of six most frequently used GARCH family models, including GARCH, BEKK-GARCH, GARCH-X, BEKK-X, GJR-GARCH, and TGARCH. Five agricultural commodities containing coffee, wheat, soybean, live cattle and live hogs are explored. The first three products are categorized as storable goods that can be stored for years and have more stable price than non-stable demand-supply; the live cattle and live hogs are non-storable products which have physically or economically infeasible storage and demand almost equals to supply for non-storable goods. Based on 28 years data (1980-2008), in-sample estimation and non-overlapping two out-of-sample forecasts of hedge ratio and return for storable and non-storable products are executed with normal and student t distributed error. The forecasting accuracy of them is compared comprehensively under seven error evaluations. Overall, results indicate that forecasting power of models somewhat depends on the commodity, the error distribution, and forecast horizon. However, the asymmetric GARCH models have great predictive power in HR forecasting for non-storable commodity.

Can We Predict Exchange Rate Movements at Short Horizons?

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In the paper, we explain the unpredictability of exchange rate movements at short horizons. Our discussion is based on the uncovered interest parity condition under uncertainty. For this, we generalize Chaboud and Wright's (2005) findings that the UIP hypothesis holds over very short windows of overnight period data but may not be compatible with conventional data frequencies, such as monthly, quarterly, and yearly series. Specifically, we propose that, at very short intervals, exchange rates follow a martingale process, but may deviate the random process by incorporating some predictable components over long time intervals. In contrasted with the current UIP literature, which do not take account of the time dependence of the UIP condition, in this study we show that the risk-neutral martingale-version hypothesis can be characterised only as a special case at short horizons in the framework of the time varying risk premium increasingly associated with time intervals. Using major US dollar exchange rates, the asymmetric pattern of exchange rate changes is empirically examined by altering sample frequencies. In order to see how the unpredictability of exchange rates at short horizons is changed by predictable components due to the endogenous factors related to uncertainty in the future, as the time horizons of sample frequencies are increased, we use a simple random walk model rather than an economic model. Our results show that exchange rates seem to follow a martingale process in the case of daily data but to depart from the random process, as sample frequencies are lowered to longer interval series. The evidence has an implication that economic fundamentals are of little use in forecasting exchange rates at short horizons but may be useful for the prediction over long horizons. This may provide a partial answer on the exchange rate disconnect puzzle often found in the current literature of exchange rates.

Crude Oil Spot Prices and the Market's Perception of Inventory News

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Market news and announcements are among the driving forces behind crude oil price fluctuations. Our paper focuses on investigating the impact of certain inventory news, provided regularly by the US Energy Information Administration (EIA). We use the discrepancy between crude oil inventory forecasts and actual inventory levels as a proxy for investor perception of inventory news. Technically, our analysis rests on a two-step model: Firstly, a measure of the market's perception, on a weekly basis, of inventory news is obtained as the deviation between actual inventory and forecast. Then, the series of daily crude oil spot prices is fitted to a regression model with GARCH residuals, where covariates render the impact of inventory news. Our findings suggest that there is an asymmetry with respect to the sign of the discrepancy between inventory forecasts and actual inventory levels. Furthermore, we find that a pronounced impact of the market's perception on crude oil prices has only begun to appear in recent years.

ENR4

Contributed Session: Energy

Wednesday 29 June 11:00-12:30pm   Room: RB211

Chair: Luis Nune**s**

Forecasting short-term electricity demand using dimension-reduction based methods

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Increased competition in electricity markets induces rapid changes in the customer base of utilities and results in substantial changes of usage patterns over time. Additionally, grid operators demand higher frequency load curve forecasts with 15 minutes intervals being the norm. Standard time series techniques are not particularly well suited to handle these matters. In this paper we compare several dimension-reduction based methods of short-term load forecasting including the recently developed SVD-based exponential smoothing (Taylor 2010) against more traditional methods where the load for each period of the day is modeled independently. All forecasting methods are applied to 15 minutes and hourly electricity load series of a large metropolitan area. Preliminary results show that the analyzed methods perform well against standard seasonal ARIMA models. We also analyze the impact of incorporating time-varying SVD on forecast performance.

Prediction of French electricity consumption by means of nonlinear autoregressive functional valued discrete time process

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Due to the new competitive electrical environment, Electricité de France, in order to keep a good accuracy for the consumption's forecast (currently 1.5% for the following day) has to adapt its historical methods using non linear scalar regression or ARMAX while taking into account the weaker stationarity of the electrical load curve. Alternative methods have been studied to provide answers to problems such as adaptivity, nonstationarity, parsimony, lack of data. One of these methods relies upon the use of functional data derived by slicing the continuous-time process of the load curve. This way, one obtains a functional valued discrete time process. Linear autoregressive Hilbertian model, a natural extension of AR model to functional process, seems to be not enough to capture the richness of the electricity consumption process. Antoniadis et al. (2006) proposed a concurrent method for a more general nonlinear functional value autoregression process. The functional nature of curves is represented by means of the wavelet transform. The resulting predictor is a weighted mean of past values where weights depend on the similarity of daily load curves. Wavelets play a key role in the search of similarities between quite rough curves. In this presentation we will specify the method and show the results of its direct application to the electrical load curve. The performance is hampered by the existence of an evolving mean level and groups on data. Both problems are solved by predicting the mean level of the load curves and by the use of (transitions of) calendar information to group daily curves into clusters. Preliminary results yield satisfactory prediction performance even without explicitly introducing the temperature as an explaining variable. One may prefer to include it during the clustering phase so as to make the (conditional) stationary hypothesis plausible. More research is in progress in this direction.

Load profiling and forecasting: Dealing with mixed frequency data

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A major challenge for forecasting energy demand at the individual level is that consumption is typically measured at infrequent and irregular intervals. Only more recently, are utility companies installing smart meters allowing them to collect data at the intra-daily resolution. Therefore, in order to estimate load profile models that can be used for short to medium term forecasting and that are able to account for seasonality, temperature effects, individual segmentation, among other factors, it becomes necessary to combine datasets sampled at different and varying aggregation levels. This paper proposes a non-linear statistical model that is able to account for these features. Using real data, the forecasting performance of the model is evaluated at the individual and aggregated levels. The results obtained provide useful directions regarding the benefits of using more sophisticated data collection technologies.

Multiple structural break and energy forecasts : application to diesel cars equipment in France

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Diesel oil consumption rapidly growths in Europe during the last decades up to 202 million of tons in 2008. This increase is mainly attributed to the growing transport needs by trucks and to the switch between gasoline and diesel cars. Nowadays most of the passenger cars sales are diesel cars. This increasing share of diesel engine for passenger cars could be associated to the evolution of the household income, the spread between gasoline and gas oil price, and to the performance of the diesel engine with a lowest fuel consumption. In this context, we build an econometric cointegration model in order to establish a long term equilibrium between le diesel car share, the GDP, the price spread and the engine fuel consumption in France. We use quarterly data from 1985-Q1 to 2008-Q3. The classical Chow test and cusum of squares test point out several structural break dates over the sample. When we carry out the unit root test with structural break (Perron, 1997) some of these dates are significant. Consequently, we apply the Bai and Perron procedures (1998, 2003) to test for multiple break points and the recent Kerjrival and Perron (2008) developments in cointegrated regression models. We compare the different test procedures and we establish a long term equilibrium for the diesel car share with a decreasing impact of the price spread and an increasing effect engine performance. We use the ECM representation to simulate impulse response function. We analyze the consequences of these structural breaks on the long term energy demand forecast in the case of diesel oil.

EBC11

Contributed Session: Economics and Business Cycles

Wednesday 29 June 11:00am-12:30pm   Room: RB212

Chair: Katja Drechsel

Forward Rates, Monetary Policy and the Economic Cycle

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Forecasting the next moves of any Central Bank ideally means to mix quantitative and qualitative data sources, which still is a challenging project up to now. The short end of the yield curve however incorporates in its market quotes most of the necessary information, in a biased manner. I therefore propose a new method to forecast the Fed and the ECB rates by correcting the swap rates for their cyclical premium, using an affine term structure model. The corrected yields offer a higher forecasting power than the yields themselves, in an out-of-sample exercise. I compare the approach advocated here to Bernanke et al. (2005)\'s Factor Augmented VAR. I find that correcting yields for this cyclical premium leads to an improvement in terms of forecast accuracy over the FAVAR method. Finally, I discuss the differences between the US and the EMU cases: the underlying fundamentals to these forecast premia are related but different.

Comovements of the Dow Jones Stock Index and US GDP

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This paper explores the connection between Dow Jones industrial average (DJIA) stock prices and the US GDP growth. Both series are heteroscedastic, making standard detrending procedures, such as Hodrick-Prescott or Baxter-King, inadequate. The results from these procedures are compared to the results from heteroscedasticity corrected data, allowing for measuring the effect of the neglected heteroscedasticity. The analysis is mainly done in the frequency domain but relevant time domain results are also reported. Accounting for the heteroscedasticity renders efficient estimation of both univariate and bivariate spectral densities, which might be exploited for forecasting growth.

Early Estimates of Euro Area Real GDP Growth: Improving the Extrapolation of Monthly Indicators

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Short-term forecasting of GDP growth is important for real time policy making as GDP data is available only about six weeks after the end of the quarter to which they refer. This paper aims at improving the performance of the so-called bridge equations, one of the short-term GDP growth forecasting tools extensively used in policy-making institutions, which is based on linear regressions models in which earlier available monthly indicators are used to bridge the gap of missing GDP data. More specifically, the forecast accuracy of the GDP bridge equations is enhanced by minimizing the prediction error entailed in the extrapolation of the monthly indicators they rely on. This is achieved by searching for the model with the best forecast accuracy among a battery of nested models used to produce the quarterly extrapolations of monthly indicators. The model selection will be done using the Hubrich and West 2009 max-t test of simultaneous forecast evaluation of small nested model sets. The competing nested models consist of ARs, VARs - with the optimal lag length decided by the Akaike Information Criterion – and Bayesian VARs. We estimate a large number of (B)VARs with different combinations of variables included, based on pairwise correlation tests run between each pair of indicators, similar to the Granger causality test. The forecast evaluation is performed as an out of sample pseudo real time forecasting exercise, i.e. due account is taken of the pattern of available monthly variables over the forecast cycle, on a sample before and after the recent business cycle. In addition, we will distinguish between whether past, current or next quarter of GDP growth is forecast since it has been shown that the choice of the respective bridge equations, and the underlying monthly indicators, depends crucially on the positioning in the forecast cycle (Hahn and Skudelny, 2008).

Sparse PLS for Macroeconomic Forecasting

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The availability of large data sets opens the possibility of using a lot of information to forecast a certain target. However, the curse of dimensionality appears and we need to reduce the dimension of the subspace containing the predictors. In order to do this, dynamic factor models and related techniques, as principal components, have been used. Nevertheless these methods do not take into account the forecasting goal while reducing the dimension. This paper investigates the usefulness of partial least squares techniques, an alternative to principal components regression, that takes into account the variable to be forecast. We analyze different ways of applying it in a time series context. Furthermore, we also introduce sparse partial least squares as a way to improve the forecast efficiency by simultaneously taking into account the variable being forecast while forming an informative subset of

predictors, instead of using all the available ones to extract the factors. We use the Stock and Watson data base in order to compare the forecasting performance of the sparse methods to those widely used nowadays as principal components Our preliminary results indicate that the sparse models have a better forecasting ability than the considered alternatives.

A comparison of bottom-up approaches and direct forecasts of German GDP in a data-rich environment

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This paper concentrates on early estimates of GDP growth for the German economy. We present a framework for forecasting, nowcasting and backcasting that incorporates a large set of available information of monthly and quarterly indicators from various sources including financial variables, survey indicators, composite leading indicators and real economic indicators (industrial production, turnovers,…). Given different levels of available information we carry out different forecasting rounds (twice a month) to simulate the forecasting process in pseudo real-time. For monthly indicators, we use MIDAS regression models to efficiently characterize the monthly information provided by indicators. Afterwards, model averaging strategies are applied to generate aggregate forecasts (shrinkage techniques, AIC-weights, Bayesian weights and MSFE weights). Thus our first contribution is to analyze systematically the role of new information and incoming data to construct real-time estimates of quarterly real GDP growth. The second aim of the paper is to compare the forecasting accuracy of models forecasting aggregate GDP directly as opposed to aggregating forecasts of GDP components. Disaggregate approaches or bottom-up approaches can be either based on the demand side (by combining private consumption, investment, exports,...) or on the production side (by combining the gross value added from different sectors, e.g. manufacturing, construction, services,...). Our results reveal that forecasting GDP directly is most favorable when not much information is available for the ongoing quarter (i.e. for the first forecast rounds). Whereas for nowcast exercises (when more information is available), it is often advantageous to use a bottom up approach based on the production side. Forecasting GDP by summing up the forecasts for the demand components is less effective compared to direct forecasts. Further, encompassing tests reveal that there is considerable information contained in the disaggregated approaches beyond that in the direct approach which can be mostly attributed to the production side.

BAY2

Contributed Session: Bayesian Methods

Wednesday 29 June 11:00am-12:30pm   Room: RB213

Chair: Jan Mandel

Predictivistic Bayesian Forecasting System

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This paper introduces a formal method of combining expert and model density forecasts. It works directly with the expert forecast density and endogenously delivers weights for forecast combination, relying on probability rules only. We apply a simple version of the framework, based on an autoregressive model and forecasts from the Survey of Professional Forecasters, to US inflation. The results of the out-of-sample forecasting performance evaluation suggest that while the point forecasts generated with our approach are less accurate than those from experts alone, the proposed method clearly outperforms experts in terms of interval forecasts.

Copula-based Simultaneous Approach to Multivariate Brand Choice and Purchase Quantity

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Consumers confront many things to decide: category, brand, and Quantity Choice, while grocery shopping. In this situation, these sub-decisions could be correlated each other. First, there is a certain amount of correlation between category choices. For example, it is highly likely that cereal and milk are purchased together. Second, a correlation could be found between brand choices. Specifically, the products from different categories but from same brand

might be purchased together. Third, brand choice and purchase quantity could be correlated. A consumer tends to buy a lot when prices are moderate, but purchase less when prices are expensive. Even though there are various types of correlations in grocery shopping, most studies would not deal with these correlations. So far, they have accounted for multinomial brand choice and purchase quantity separately. Therefore, this study suggests a copula based approach to simultaneously incorporate multivariate brand choice and purchase quantity, so that it could account for all possible correlations in grocery shopping, such as correlation between categories, correlation between brands, correlation between brand choice and purchase quantity. We apply this model to IRI scanner panel data and estimate the model by using Bayesian method.

A New Bayesian Formulation for Time Series Forecasting

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In this paper we propose a new approach for time series forecasting based on a Bayesian formulation. Specifically, we assume a predefined set of basic functions, fit the time series to this basis function, and extrapolate it in a Bayesian probabilistic framework. An example of this could be linear and higher order powers up to a certain order. The prior is selected in a way that favors smooth fits, and is given in terms the probability density of the integral of the square of the second derivative. We derived the Bayesian formula of the forecast and reduced it to a two-dimensional integration, which can be computed numerically in a straightforward way. This approach has several benefits. For example, many time series need more than the linear extrapolation that is modeled by exponential smoothing type forecasting models. The time series could exhibit an accelerating or a decelerating curving trend, and these cases could be modeled by higher order terms using our approach. The other benefit of the proposed approach is that it also gives the density of forecasts. Our work is compared with other forecasting methods like autoregressive models, and exponential smoothing on yearly time series. The results of simulation confirm that this method gives favorable performance compared with other approaches.

Forecasting using Bayesian Model Averaging and Bayesian Nonparametrics

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Nowadays, there is no doubt about the advantages of using Bayesian methodology in forecasting. Until now the Bayesian framework considered in this field is the parametric one, with the Bayesian Model Averaging (BMA) approach being the superstar in that framework, in particular as one of the preferred tools to forecast economic magnitudes like the inflation rate or financial variables like exchange rates. On the other hand, in the last thirty five years the Nonparametric Bayesian (NPB) approach in statistics has been widely developed with some seminal papers, but very few works contribute to develop this methodology in the field of time series and as far as my knowledge goes there are no papers on forecasting using this methodology. In fact, the first step in the NPB approach to forecasts combination was given at the ISF 2008 Conference in Nice. This paper presents the results of the BMA applications in forecasting giving some reasons to the success of that approach and generating some

principles to use that approach in forecasting. In addition, some comments with the NPB approach in forecasting using Dirichlet processes will be delivered and some conclusions about advantages and disadvantages of this approach in relation to the BMA approach will be obtained.

Spectral and morphing ensemble Kalman filters and applications

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Forecasting the behavior of wildland fires, precipitation fronts, and epidemic spread presents some common challenges. Solutions of the models, based on partial differential equations, are large arrays defined on grids. In addition, the solutions exhibit coherent features, such as fire lines, weather fronts, and epidemic waves, and a large part of the uncertainty is in the position of those features. Data assimilation updates the forecast by incorporating new data from time to time by Bayesian statistical methods, which try to balance the uncertainties in the model and the data. A new forecast is then obtained by advancing the model in time from the updated state. In ensemble methods, the uncertainty in the forecast is represented by the spread of a collection of simulations, called an ensemble. The ensemble covariance is a measure of the uncertainty. When the random errors are homogeneous in space, different frequency modes of the error are independent, which allows efficient data assimilation by the fast Fourier transform (FFT). Wavelets are even better suited for expressing the ensemble covariance, because they are local in frequency as well as in space, thus allowing for situations when the uncertainty varies by the location. We show that diagonal covariance in the wavelet space is generally sufficient, and it leads to efficient computations using the fast wavelet transform. We decouple positional and amplitude components of the errors by morphing methods, thus enabling efficient corrections that can blend changes in the position of the coherent features of the solutions with changes in their amplitude.