International Institute of Forecasters presents:

The 32nd International Symposium On Forecasting

Boston, USA – June 24-27, 2012

PROCEEDINGS

ISF electronic proceedings (ISSN 1997-4124)

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The *Foresight* Practitioner Track at ISF 2012

MONDAY, JUNE 25

The Forecasting Process: Auditing Performance, Designing Improvement, Assessing Actual and Potential Forecast Accuracy

INTRODUCTION 8:15am-8:30am, KEYNOTE ADDRESS 8:30am-9:30am. SALON G

Improving Judgments Through Simulation: Exploiting Kind Environments

Robin Hogarth, Author of *Judgment and Choice: The Psychology of Decision* and W*hy Forecasts Fail: What to do Instead*

When can people be expected to make accurate judgments? In general, we are effective in extrapolating from the actual data we observe. However, the samples we see can be kind or wicked in the sense they are or are not representative of the underlying process. In this keynote, Robin Hogarth will explore a strategy for using simulations to design task environments where people can make accurate judgments after simply observing data that are representative of the processes being predicted; that is, simulations from kind environments. He will illustrate the approach through a series of examples, and explore the implications and limitations of the proposed method.

SESSION 9:40am-10:25am. WELLESLEY

The Forecasting Process: Guiding Principles

Steve Morlidge, Author of *Future Ready: How to Master Business Forecasting*

In his book, *Future Ready: How to Master Business Forecasting*, Steve Morlidge offered a first cut at principles for managing a business-forecasting process. He continued his exploration in his 2011 *Foresight* series on guiding principles for the forecasting process. Explore with Steve the critical foundation, design, process, and behavioral principles that make up a successful forecasting process and nurture effective forecasting performance.

SESSION 10:50am-11:35am. WELLESLEY

Forecastability: Driving Improvement in Forecasting

Sean Schubert, Senior Manager, Supply Chain at Newell Rubbermaid

The second most asked question in Demand Planning and Forecasting is "What should my forecast accuracy be?" (The first question is "How many SKUs can a Demand Planner forecast?") Externally benchmarking companies in similar industries is one approach to answering this question, but we don't always know the true company details with respect to lead time, level of forecast, and most importantly what the companies scrub out of their calculations. Sean Schubert will discuss new approaches you can adopt to measuring forecastability and setting forecast accuracy targets.

SESSION 11:40am-12:25pm. WELLESLEY

Tracking and Evaluating Forecast Accuracy

Jim Hoover, Director, DoD Supply Chain Solutions at Accenture

The desire to improve forecast accuracy is a principal factor behind ERP systems. While much attention has been paid to measuring forecast accuracy for individual items, Jim Hoover has seen little attention to the challenges of tracking accuracy over time, especially for item aggregates. Some surveys have found that barely half the companies had created a formal procedure to measuring and tracking forecast accuracy. Jim's presentation will lay out the obstacles companies face in tracking accuracy over time, and provide you with a template for developing a coherent tracking system that provides a "forecasting autopsy" that explains unmet accuracy targets and identifies routes to improvement.

SESSION 1:35pm-2:35pm. WELLESLEY

Forecast Process Design and Change Management
Joe Smith, Revenue Manager at Dean Foods
Simon Clarke, Director of Forecasting at Coca Cola Refreshments

Companies frequently are eager to focus on forecasting tools as the solution that will bring them cost savings and revenue improvement. In truth, the glue that holds everything together across business functions is people and process. Good process design is a prerequisite to optimize forecast performance and assure reliability. Join forecasting veterans Joe Smith and Simon Clarke, for their design recommendations and lessons learned through implementing a new forecasting process at Coca Cola.

SESSION 2:40pm-3:25pm. WELLESLEY

A Mantra for Auditing Forecast-Process Performance
Alec Finney, Principal of Rivershill Consultancy

Since a top-quality forecasting and planning process is the key to delivering good business performance, it is important to periodically audit the process and determine what needs to change. Alec Finney will discuss the three key elements of a forecast process audit to help you create an audit process that draws out areas of satisfaction and unease, and produce a full picture of what's right, what's wrong, and what might be missing.

SOFTWARE SHOWCASE 3:50pm-5:25pm. SALONS J-K

Software Showcase and Reception
Join our generous sponsors as they showcase their forecasting software products. You'll gain insight into an array of quality tools as you enjoy a lovely wine and cheese reception.

TUESDAY, JUNE 26
Sales and Operations Planning (S&OP): Reaching its Potential

INTRODUCTION 8:15am-8:30am, KEYNOTE ADDRESS 8:30am-9:30am. SALON G

Succeeding in Uncertain Markets
Phil Dolci, President and CEO of Jarden Branded Consumables

Today's business leaders have an ever-increasing amount of data at their fingertips. But the data and the models that forecasts feed them only provide an illusion of precision and control. CEO Phil Dolci found that because demand fluctuations are inherently unpredictable, the key to success is not to try to predict the variability, but rather to employ a strong process that manages through the variability. Executive S&OP provided him with an effective process to do this. Learn how Phil built support for S&OP across the organization, and discover which of the best practices in S&OP are counterintuitive, yet necessary. You'll gain insight into the benefits of a successful Executive S&OP implementation—increased operating profit, reduced working capital, and increased service levels—how they are achievable, and why they're well worth the investment.

SESSION 9:40am-10:25am. SUFFOLK

S&OP Implementation – Doing It Right
Amy Mansfield, Planning Manager at V&M Star

Though the benefit of using Executive S&OP in organizations has been well documented, too often a haphazard implementation process brings unexpected (and disappointing!) results. Walk through the process with Amy Mansfield and learn how to avoid the four main pitfalls of a poor implementation, as well as how to choose the right approach and strategy for your successful implementation of Executive S&OP. Find out how to 'Do It Right' so you don't have to do it again.

SESSION 10:50am-11:35am. SUFFOLK

The Power of Alignment and Its Effect on Corporate Culture
Brad McCollum, S&OP Manager, Jarden Branded Consumables

Executive S&OP has three primary objectives: 1) Balance Demand and Supply at the volume level, 2) Fully integrate with financial planning, and 3) Connect the dials between corporate objectives on risk, strategy and policy, and the tactics required to support them. Though achieving these objectives delivers substantial financial return, it almost always requires significant cultural change. The culture change aligns the organization's human energy, which powers the hard benefits. Learn how Executive S&OP brought about alignment at Jarden Home Brands, and how those changes continue to support an environment of teamwork, honesty, and continuous improvement.

SESSION 11:40am-12:25pm. SUFFOLK

Gaining Necessary & Appropriate Top Management Buy-In

Indar Chaudhuri, Director, Supply Planning at Daiichi Sankyo

Executive S&OP sounds like a good idea — perhaps even a no-brainer. Who wouldn't want to balance demand and supply to ultimately drive financial results? However, getting the S&OP process off the ground is never easy. Balancing different viewpoints from different silos within a complex organization to achieve consensus-based plans is a delicate task that begins with the first step: selling the idea of S&OP to top management. Follow one company's successful journey down this path: the hurdles they faced, the strategies they employed, and the difficult conversations they navigated to drive consensus and get the proverbial green light to move forward with what turned out to be a transformational project.

SESSION 1:35pm-2:35pm. SUFFOLK

Lean Manufacturing, S&OP, and GIS: Proper Tools for Global Management

Jeff Greer, Senior VP Operations at KVH Industries

Shortly after Jeff Greer joined KVH in 1994, everything changed. Globalization extended the company's supply chain on both the selling and buying ends of the business. Coping with these shifts required the company to implement the proper tools; first Lean Manufacturing, then S&OP, and finally, a supply chain modeling method using a Geographic Information System (GIS) used within their S&OP monthly process. Join Jeff as he puts the events and technologies into context, to show you how KVH has remained competitive in a fully global market – on both ends of their business.

SESSION 2:40pm-3:25pm. SUFFOLK

Achieving S&OP Maturity

Noha Tohamy, VP Research, Gartner, Supply Chain

Companies that do S&OP well testify to the predictability and transparency it brings to the business, but mostly in the later stages of the maturity curve. Gartner research has found that 67 percent of companies remain in Stage 1 or 2 of our four-stage S&OP maturity model. How exactly do companies move beyond Stage 2, and how do they sustain the process? Noha Tohamy will lay out the four-stage S&OP maturity model, and will show what research has found about:

- What it takes to advance in the S&OP maturity model
- Whether S&OP should follow a standard approach, or be tailored to specific areas of a business
- What companies are doing to overcome obstacles in achieving S&OP maturity
- What role finance or financial integration typically plays in deriving greater value from S&OP

SESSION 3:50pm-5:25pm. SUFFOLK

Q&A Session with our S&OP Panel of Experts

Moderated by Bob Stahl, *Foresight* S&OP Editor

Don't miss this unique opportunity to ask your S&OP questions of this successful group of S&OP experts — all of today's speakers! Questions about the talks of the day, or specific questions about the circumstances back at your company, are all within scope.

GALA EVENT 7:00pm-11:00pm

Gala Event at the Harvard Club

A special evening of food, entertainment, and networking with your fellow forecasters and experts, all in a superb, classic and historic Boston venue! The evening includes drinks, New England cuisine and entertainment. Inquire at the registration desk about tickets. There is an additional charge for this event.

WEDNESDAY, JUNE 27
Scenarios and Foresight: Looking Beyond the Immediate Future

INTRODUCTION 8:15am-8:30am, KEYNOTE ADDRESS 8:30am-9:30am. SALON G

Forecasting with Many Predictors: What Have We Learned?

James Stock, Professor of Economics, Harvard University; NBER Business Cycle Dating Committee

The past decade has brought tremendous methodological progress and a great deal of empirical work on using many predictors to nowcast the present and forecast the future. James Stock will review that work, focusing on the practical lessons for forecasting with many predictors. Professor Stock will compare dynamic factor models with other approaches available. He'll examine the extent to which the models provide robust platforms for forecasting, particularly their ability to produce forecasts that are less prone to major disruptions (structural breaks). To illustrate, he'll use the models performed in predicting the 2007-2009 recession and subsequent slow expansion in the United States.

SESSION 9:40am-10:25am. WELLESLEY

Anticipating Shifts in the Operating Environment, Prioritizing Opportunities, and Implementing Future-Wise Solutions

Adam Gordon, Author of *Future Savvy: Identifying Trends to Make Better Decisions and Profit from Change*

Scenario Planning is a qualitative approach to building foresight in situations where future uncertainty levels are medium-high — situations beyond the credible reach of all forms of quantitative, predictive, or extrapolative forecasting. Since the scenario approach to foresight first came to general management and academic prominence in the mid-1980s, the method has been reworked and refined, mostly via practitioner experimentation. In this presentation, Adam Gordon, author of *Future Savvy* and *Management By Looking Ahead* will present his recent research in the field, showing via case studies where the unassailable value of scenario process remains for planners, while also describing how and where the method overreaches.

SESSION 10:50am-11:35am. WELLESLEY

Using External (Mostly Free) Resources for Medium- to Long-Range Forecasting

Roy Pearson, Author, Economic Forecaster, *Foresight* Forecasting Intelligence Editor

Strategic foresight enhances our understanding of plausible future strategic operating environments. As the planning horizon lengthens to five, ten, fifteen or more years, such foresight becomes more global and multi-dimensional, encompassing the interaction of demographic, economic, government, environmental, social, and technological forces and shifts. Join Roy Pearson as he surveys future-focused internet sites with baseline forecasts, assessments of signals and trends, exploration of the dimensions of uncertainty, and scenarios centered on a wide variety of issues and horizons. This session will be an annotated journey through a sampling of readily-available foresight approaches and outcomes.

SESSION 11:40am-12:25pm. WELLESLEY

Technology Forecasts for Strategic Planning

William E. Halal, Professor Emeritus, George Washington University and President, TechCast LLC

The world is experiencing a technology revolution, but organizations lack guidance on how it impacts them and how they should respond. The ongoing research at TechCast offers useful insights. TechCast is a virtual think tank that scans for trends and pools the knowledge of more than 100 experts online to forecast breakthroughs for corporations and governments in real time. Professor William Halal will describe TechCast's "Collective Intelligence" research method, present highlights of the results and "macroforecasts" of the impact on society, and reveal the implications for technology forecasting systems.

MONDAY JUNE 25 2012

08:30 - 09:30 **KEYNOTE SESSION 1** Room Salon G
Chairperson: Paul Goodwin, University of Bath

IMPROVING JUDGMENTS THROUGH SIMULATION: EXPLOITING KIND ENVIRONMENTS

Robin Hogarth, ICREA & Universitat Pompeu Fabra

When can people be expected to make accurate judgments? I believe the key considerations include:

• the inherent predictability of the environment
• whether the judgmental task is one-time or ongoing
• whether the judgment itself can effect outcomes; for example, when general economic forecasts have impacts on investment levels in the business community.
• whether the samples of data observed are or are not representative.

In general, people are effective in extrapolating from the actual data they observe. However, the samples they see can be kind or wicked in the sense they are or are not representative of the underlying process. These considerations lead to a strategy for using simulations to design task environments where people can make accurate judgments after simply observing data that are representative of the processes being predicted; that is, simulations from kind environments. The approach is illustrated through a series of examples involving predictions from regression models, Bayesian updating, and assessments of the chances of success when entering competitions. Further implications and limitations of the proposed method are also discussed.

09:40 - 10:25 **THE FORECASTING PROCESS 1** Room Wellesley
Chairperson/Organizer: Len Tashman, Editor of Foresight

THE FORECASTING PROCESS: GUIDING PRINCIPLES
Steve Morlidge, Satori Partners

In my 2009 book, "Future Ready: How to Master Business Forecasting", and 2011 series of articles for Foresight, I offered a first cut at principles for managing a business-forecasting process. My presentation will highlight the critical foundation, design, process, and behavioral principles that distinguish the successful forecasting process and nurture effective forecasting performance.

09:40 - 10:25 **APPLICATIONS** Room Boston Univ
Chairperson: Egon Smeral, Austrian Institute of Economic Research

THE PREDICTIVE POWER OF HOUSEHOLDS' EXPECTATIONS IN HOUSING NONLINEAR DYNAMICS
MeiChi Huang, Yuan Ze University

This study confirms that households' expectations are informative for out-of-sample forecasts of the housing boom and bust phases in the period 2003-2010. The model incorporates the structural break and the threshold indicator, two nonlinear features of the US aggregate housing price which have hardly been considered in the housing market literature. The framework extends the structural break threshold VAR (SBTVAR) to investigate the housing sector, and introduces the good-time-to-buy (GTTB) index, which proxies for households' expectations as well as acts as a threshold indicator for the housing price dynamics in the period 1978-2010. The SBTVAR model captures the onset of the recent housing bust by specifying that recursively-estimated breakpoints shift from "1987-1989" to "1996-1997" as housing market information for the period from December 2005 to September 2007 is utilized into the analysis. The estimated value of the GTTB threshold indicates the fact that households are more optimistic about housing price growth after 1989 than during the pre-break period, and that they adjust expectations downwards in 2005. In general, the persistent low-expectation phase begins in March 2006, which highly coincides with the recent housing bust, and the GTTB index signals the recent housing bust through regime-switching expectations three periods in advance.

VARYING ELASTICITIES OF TOURISM DEMAND AND FORECASTING PERFORMANCE
Egon Smeral, Austrian Institute of Economic Research
Co-Author(s): Haiyan Song, School of Hotel and Tourism Management, The Hong Kong Polytechnic University

This study examines the anomalies in tourism behaviour due to business cycles. We assume that tourists' demand reactions are asymmetric in different phases of the business cycle. Specifically, this is to say that tourists will behave differently when the economy grows in terms of the real GDP faster than the flexible trend as compared with that situation when the economic growth is below the growth rate of the flexible trend. In order to test the

validity of such a hypothesis, the quarterly data on the demand for international tourism by the United States of America, Canada, Australia, Japan and the EU-15 are collected and analyzed using a growth rate model that allows the income and price elasticities to vary across the business cycles. This growth rate model is also estimated using the time varying parameter (TVP) method. The evidence clearly demonstrates that the demand elasticities are indeed asymmetric during the business cycle. A forecasting exercise is also carried out to compare the forecasting performance of the growth rate model allowing varying demand elasticities across the business cycles with that of its TVP counterpart. The results show that the TVP model does not perform well as suggested by the previous studies.

09:40 - 10:25 **ENERGY MARKETS** Room Maine

Chairperson: Diane Pierret, Universite Catholique de Louvain

HOW THE STOCHASTIC PROBLEM DRIVES THE BRAZILIAN ELECTRIC SECTOR

Pedro Guilherme Costa Ferreira, Pontifical Catholic University
Co-Author(s): Reinaldo Castro Souza, Pontifical Catholic University

This article aims, first of all, at presenting the reader a broad perspective of the Brazilian Electric sector, identifying the process of transformation through which it underwent during the last decades, arriving at the Brazilian Electric Sector's (BES) New Model. With this New Model, it is shown how a good modeling of the stochastic variable is determinant to the good functioning of the BES' three fundamental pillars, that is, planning, operation, and accounting and settlement process of the energy transactions in the short term market.

NEW RISK MEASURES IN ENERGY MARKETS

Diane Pierret, Universite Catholique de Louvain

We investigate the concept of systemic risk in the energy market and propose a new methodology to measure it. By analogy with financial markets, the energy market is regarded as a sector that supports the whole economy. Common movements in energy assets are analyzed through measures of causality, common factor exposure and sensitivity to extreme market events. We find evidence of linear and non-linear causality among the daily returns of energy assets and an industrial index. After removing causal relationships, we estimate the dynamic exposure to common latent factors based on a principal component analysis of time-varying correlations. The systemic risk sensitivity of each asset is estimated with the Marginal Expected Shortfall (MES) capturing the tail dependence between the asset and the first common factor interpreted as the energy market index.

09:40 - 10:25 **ESTIMATING RECENT AND CURRENT MACROECOMIC TRENDS A** Room Yarmouth

Chairperson/Organizer: Filippo Moauro, Eurostat

ONE-SIDED REPRESENTATIONS OF GENERALIZED DYNAMIC FACTOR MODELS

Marco Lippi, Dipartimento di Scienze Statistiche, Roma, La Sapienza

In the present paper we study a semiparametric version of the Generalized Dynamic Factor Model introduced in Forni, Hallin, Lippi and Reichlin (2000). Precisely, we suppose that the common components have rational spectral density, while no parametric structure is assumed for the idiosyncratic components. The parametric structure assumed for the common components does not imply that the model has a static representation (though the converse implication holds), a strong restriction which is shared by most of the literature on large-dimensional dynamic factor models. We use recent results on singular stationary processes with rational spectral density, to obtain a finite autoregressive representation for the common components. We construct an estimator for the model parameters and the common shocks. Consistency and rates of convergence are obtained. An empirical section, based on US macroeconomic time series, compares estimates based on our model with those based on the usual static-representation restriction. We find convincing evidence that the latter is not supported by the data.

NOWCASTING EURO-AREA GDP BY MEANS OF COINCIDENT INDICATORS: AGGREGATED VERSUS DISAGGREGATED APPROACH

Filippo Moauro, Eurostat
Co-Author(s): Françoise Charpin, OFCE Analysis and Forecasting Department and University of Paris II and Gian Luigi Mazzi, Eurostat

The paper presents most recent achievements of coincident indicators realized by Eurostat with the aim of providing real time estimates of GDP in the euro area by means of econometric methods. From their first implementation two approaches have provided higher forecasting performances: bridge models and factor models where targeted predictors are selected through the LARS algorithm. Under a general discussion on unbiasedness of most recent forecasts of these models, it is investigated if the aggregated approach -GDP directly modelled in the euro area dimension- should be preferred to a disaggregated one -coincident indicators of the largest euro area countries computed separately and then incorporated into the model for the euro area. Furthermore, the work investigates possible improvements obtained from one side introducing an error correction term, both in country and euro area models, and from the other substituting bridge regressions with MIDAS regressions. Preliminary results based on a pseudo real time exercise are shown, revealing the cases when the disaggregate approach and the introduction of the error correction term increase the forecasting performances.

09:40 - 10:25 **EXPONENTIAL SMOOTHING** Room New Hampshire
Chairperson: James Taylor, Said Business School, University of Oxford

EXIST: EXPONENTIAL FILTERING AND FORECASTING OF IRREGULARLY SPACED TIME SERIES
Antonio Rodrigues, CIO-FCUL, University of Lisbon

The exponentially-weighted recursive least-squares algorithm, EWRLS — also known as the exponential forgeting version of RLS —, has not the power of the classical Kalman filter algorithm, but it may provide a very effective method for estimating any discrete stochastic model with time-varying linear parameters, while avoiding the need for a fully-specified state-space model formulation, and only requiring the much reduced effort of optimizing one single hyperparameter.
In this paper, we introduce the EXIST method: an adaptive version of EWRLS for irregularly, or unevenly spaced time series, including nonstationary ones.
We compare this new method, both from an analytical and an empirical point of view, to alternative exponential smoothing methods that have been previously proposed. Illustrative applications and comparative experiments are based on several real time series, describing irregularly occurring or irregularly observed processes —either economic or physical —, including some with trends or periodicities.

FURTHER EMPIRICAL EVIDENCE ON SMOOTH TRANSITION EXPONENTIAL SMOOTHING
Wei Chong Choo, Universiti Putra Malaysia
Co-Author(s): James Taylor, University of Oxford

This paper evaluates smooth transition exponential smoothing (STES) in three new aspects. Firstly, we investigate the one-step-ahead prediction of daily volatility. Secondly, we study the robustness of STES in forecasting the volatility of a financial time series. Thirdly, we implement trading volume as the transition variable in STES. Simulation results suggest that STES is a robust volatility forecasting method, as it outperforms standard methods and several robust volatility forecasting methods. Analysis using stock return data confirms that STES is able to outperform competitors. Besides the sign and size of past shock, trading volume is an important transition variable that leads to the success of STES.

09:40 - 10:25 **LIMITS IN FORECASTING RARE EVENTS** Room Simmons
Chairperson/Organizer: Claudio Antonini, UBS

LIMITATIONS IN THE FORECASTING OF ISOLATED AND RARE EVENTS AND PREDICTION OF THEIR AWARENESS
Claudio Antonini, UBS

The incidence of isolated events cannot be forecasted; the probability distribution of rare events allow limited or no predictability. Although we are very restricted in determining when these types of events will appear, once they manifest, the public"s response to both can be predicted with reasonable certainty. This effect has scarcely been studied quantitatively in the forecasting literature but it is fundamental for various applications like eyewitness identification, the study of forgetting process in cognitive psychology, and the budgeting of advertising campaigns (which require to maintain a certain level of interest in the target markets).
Using databases that detail the number of web searches done--in addition to the location and language of the search--we can show that the responses to a single event follows a power law with exponential cutoff which die out in a very short time. Given that a drop to the level of a background noise happens at a rate comparable to the sampling rate of the searches (1 week), we look into how various sampling rates affect the estimate of the exponent of the power law. Examples from very well-known (but quickly forgotten) events will be given, including terrorist attacks, the Haiti earthquake, and the Fukushima-Daiichi episode.
At the same time, we"ll investigate how the type or magnitude of the event affects the exponent and what possible mechanisms generate this type of behavior.

THE LIMITS OF FORECASTING MODELS IN ANTICIPATING RARE EVENTS: FURTHER REFLECTIONS AND SUGGESTIONS FOR IMPROVEMENTS
George Wright, Warwick Business School
Co-Author(s): Paul Goodwin, University of Bath

In this paper we review methodologies that aim to aid anticipation of rare, high-impact, events. We examine predictability from the perspective of forecasters" ability to obtain well-calibrated probabilities or point forecasts for events and identify five factors that can lead to poor calibration and hence low predictability. We then examine how successful a range of methods are in mitigating these factors, including the use of expert judgment, statistical forecasting, Delphi, and scenario planning. We demonstrate that all the extant methods, including combinations of methods, contain weaknesses and that anticipation of rare, high-impact, events can only be achieved by judgmental heuristics that, likely, entail bias. We conclude that the only remedy is to provide conditions to challenge one"s own thinking and note that such conditions are inherent within Delphi and scenario planning techniques. We detail new methods to create challenges to thinking within Delphi applications.

09:40 - 10:25 **SHORT-TERM MACROECONOMIC FORECASTING** Room Tufts
Chairperson: Anne Sofie Jore, Norges Bank

SHORT-TERM FORECASTING FOR THE EURO AREA - THERE IS MORE THAN ONE WAY TO SKIN A CAT
Tobias Kitlinski, RWI
Co-Author(s): Philipp An de Meulen, RWI

Economic forecast accuracy highly depends on the timely availability of data. Focusing on euro area GDP, data is released with a lag of about eight weeks. To account for the latest economic developments, it is common practice to refer to indicators which are more readily available and published more frequently. However, in the academic literature there is little consensus on how to condense the information different indicators contain. In this paper, we employ bridge equations to produce a huge amount of different forecasts for the biggest countries of the euro area: Germany, France, Italy and Spain. We analyze the forecasting performance with respect to the choice of the set of indicators, the ragged-edge problem, the set-up of estimation equations as well as the condensation of the single forecasts.

SHORT-TERM FORECASTING: NORGES BANK'S DENSITY COMBINATION APPROACH
Anne Sofie Jore, Norges Bank
Co-Author(s): Knut Are Aastveit, Norges Bank, Karsten Gerdrup, Norges Bank and Francesco Ravazzolo, BI Norwegian Business School and Norges Bank

In this paper we use Norwegian real-time vintage data to produce combined density short-term forecasts for quarterly Norwegian Mainland GDP and inflation. We combine the forecasts using different pooling approaches from three main types of models typically used at central banks: Vector autoregressive models, leading indicator models and factor models. The combined forecasts are updated several times during the quarter to highlight the importance of new data releases, and results show that the performance in terms of point and density forecasting improves steadily as new information arrives. The result is robust to different pooling and weighting schemes. We apply the combined density forecasts for GDP to predict turning points of the business cycle in real-time. We find the combined forecast is accurate in nowcasting turning points in real time, but the uncertainty in the definition of the cycle related to data revision plays a crucial role in the evaluation.

09:40 - 10:25 **STREAMFLOW** Room Salon H

Chairperson: Rafael Morais de Souza, Pontificia Universidade Católica do Rio de Janeiro

SSA, HIERARCHICAL CLUSTERING AND ARIMA MODELS IN FORECASTING RESERVOIR INFLOWS

Reinaldo Castro Souza, Pontificia Universidade Católica do Rio de Janeiro
Co-Author(s): Keila Mara Cassiano, Pontificia Universidade Católica do Rio de Janeiro, Moisés Menezes, José Ferreira de Menezes and Judite Pereira de Lima, José Francisco Moreira Pessanha, Universidade Estadual do Rio de Janeiro and Luiz Albino Teixeira Junior, Pontificia Universidade Católica do Rio de Janeiro

Among the several forecasting approach available, the ARIMA model is rated as one the most used technique. Despite the good results achieved, the predictive ability of the ARIMA models can be improved through the application of singular spectrum analysis (SSA). Thus, the aim of this article is to investigate the usefulness of applying the singular spectrum analysis integrated with hierarchical clustering in the grouping stage in order to improve the predictive performance of the ARIMA model. In this paper it is applied the proposed approach to forecast the inflows in a hydro electric plant located at Parana river basin, Brazil. As a matter of fact, modeling such series are quite important for the optimal dispatch of the energy generation in Brazil, due to the heavy participation of hydro plants in the country (over 85% of the generated energy comes from hydro plants).

STREAMFLOW FORECASTING USING SINGULAR SPECTRUM ANALYSIS, ARIMA MODEL AND ARTIFICIAL NEURAL NETWORK

Rafael Morais de Souza, Pontificia Universidade Católica do Rio de Janeiro
Co-Author(s): Keila Mara Cassiano, Pontificia Universidade Católica do Rio de Janeiro, Reinaldo Castro Souza, Pontificia Universidade Católica do Rio de Janeiro, Moisés Menezes, José Ferreira de Menezes and Judite Pereira de Lima, José Francisco Moreira Pessanha, Universidade Estadual do Rio de Janeiro and Luiz Albino Teixeira Junior, Pontificia Universidade Católica do Rio de Janeiro

The ARIMA model and the Artificial Neural Networks (ANN) are two usual approaches in the streamflow forecasting. In this paper we propose a forecasting methodology which combines the monthly streamflow forecasts obtained by these two approaches. First, the singular spectrum analysis (SSA) method is applied in order to the decompose the monthly streamflow time series in k components plus a noise, all them are time series. The k component are classified in two categories: trend and harmonic components. Next, the trend component is modeled by a linear hybrid ANN-ARIMA model where the ANN and ARIMA forecasts are combined additively. The harmonic component is modeled in a similar way by a non-linear hybrid ANN-ARIMA model. Finally, the trend and harmonic forecasts are added up together in order to obtain the streamflow forecast. The methodology proposed was applied in the modeling of an important Brazilian streamflow time series and the main results from the case study are presented in the paper.

09:40 - 10:25 **TELECOMMUNICATIONS** Room Hyannis
Chairperson: Nigel Meade, Imperial College London

MODELLING AND FORECASTING MOBILE TELECOMMUNICATIONS SERVICES: A CROSS-COUNTRY ANALYSIS
Eren Eser, Middle East Technical University
Co-Author(s): P. Erhan Eren, Middle East Technical University

Mobile telecommunications industry has experienced high growth rates for the recent 30 years. Accordingly, forecasting the future of mobile telecommunications services is important not only for mobile operators but also for all stakeholders in this industry ranging from handset suppliers to vendors. In this study, the diffusion of mobile telecommunications services in 20 countries from different regions around the world is examined for the period of 1981 to 2010, in order to address the uncertainty in optimal model selection. The Gompertz, Logistic and Bass models are fitted to the observed data of mobile phone penetration rate by means of nonlinear least squares. The fitness accuracies of the models are evaluated based on RMSE. Empirical results show that S-shaped growth models are capable of explaining the diffusion of mobile telecommunications services. The findings also suggest that there is no superior model in defining the diffusion process and the most suitable model is country-dependent. Finally, we observe that the diffusion in late entrant countries appears to be faster than pioneer countries and peak demands in mobile telephones occur during the period of 1999 to 2006, which suggests a remarkable multinational learning effect and significance of the transition into digital technology.

FORECASTING IN TELECOMMUNICATIONS AND ICT - A REVIEW
Nigel Meade, Imperial College London
Co-Author(s): Towidhul Islam, University of GuelphIn 2002, the International Journal of Forecasting published a review by Fildes and Kumar of telecommunications demand forecasting, although our brief is a little wider, we use this review as a baseline. Since 2002, the literature on forecasting in telecommunications and ICT has expanded dramatically. Our objective is to critically review this literature; identify potentially useful themes and identify areas of research that warrant more investigation. Although our review is in its early stages, one emerging issue is the Balkanisation of literatures from different disciplines. Authors with an engineering background often make little or no attempt to study relevant marketing or forecasting literature, often diminishing the scope of their work.

10:50 - 11:35 **THE FORECASTING PROCESS 2** Room Wellesley
Chairperson/Organizer: Len Tashman, Editor of Foresight

FORECASTABILITY: DRIVING IMPROVEMENT IN FORECASTING
Sean Schubert, Newell Rubbermaid

The second most asked question in Demand Planning and Forecasting is "What should my forecast accuracy be?"* Externally benchmarking companies in similar industries is one approach to answering this question, but we don't always know the true company details with respect to lead Time,

level of forecast, and most importantly what the companies scrub out of their calculations. I will discuss new approaches to measuring forecastability and setting forecast accuracy targets.
* The first question is "How many SKUs can a Demand Planner forecast?"

10:50 - 11:35 **COMBINING FORECASTS A** Room Boston Univ
Chairperson: Sven F. Crone, Lancaster University Management School

IMPROVING PREDICTIONS OF COMPETITIVE EVENT OUTCOMES BY FORECAST COMBINATION
Ming-chien Sung, UNIVERSITY OF SOUTHAMPTON

Forecasting methods are routinely employed to predict the outcome of competitive events (e.g., sports events, political elections) and to shed light upon the factors that influence participants' winning prospects. We explore the potential of forecast combination to increase the accuracy of competitive event predictions; which, in turn, may have important implications for regulators of associated betting markets (concerned with issues such as market efficiency). A general premise for successful combination is that individual predictions in an ensemble are accurate and diverse. Furthermore, to accurately predict the outcome of competitive events it is important to effectively account for the intensity of rivalry among contestants. We develop modeling procedures and practices for addressing these challenges: First, in order to construct a large and heterogeneous base model library, we propose a range of surrogate measures of event outcome that facilitate the use of regression and classification. Second, a forecast calibration procedure is developed to enable average-based pooling mechanisms at the combination level. Third, to effectively account for competition among contestants, a stacking paradigm towards forecast pooling is implemented by integrating conditional logit regression and log-likelihood-ratio-based forecast selection. The appropriateness of these procedures is confirmed by empirical experimentation using data related to horseracing events.

FORECAST MODEL COMBINATION ACROSS TIME ORIGINS: AN EMPIRICAL EVALUATION
Sven F. Crone, Lancaster University Management School

The combination of multiple forecasts has received substantial attention in time series prediction, indicating that model combinations can outperform the selection of individual models. Since the seminal paper of Bates and Granger (1969), various studies have assessed the theoretical properties and empirical accuracy of ex post model combinations, to determine (a) the number of models to combine, (b) the diversity of models to combine, and (c) the combination method. More recently, dynamic methods model combinations have been introduced in the form of Bagging and Boosting, which dynamically perturb, reweight and resample the training data during the parameterization process. Despite the wide variety in combination choices discussed to date, all approaches combine trace forecasts of y made for a fixed horizon h (with h=1, …, H) from the same point in time t, denoted as yt+h|t. As a result, the realization of randomness and outliers contained in the particular time origin t may influence all predictions made from t, across algorithms. To remedy this, we propose to combine predictions across time origins for a given future point in time, e.g. combining a one-step forecast y t+1 |t made in t, with a two-step ahead forecast y t+2 |t-1 made in t-1 and so

forth, averaging over all predictions for point in time t+1. Consequently, this paper introduces a new meta-parameter in model combination, which has not been empirically assessed to date. We conduct experiments on the relative accuracy of model combination across time origins in comparison to conventional model combination at one period in time, in order to assess the efficacy of temporal model combination. The results indicated the data conditions under which temporal model combination yields positive effects on forecasting accuracy, balancing the trade-off between the decreasing forecasting accuracy in increasing forecasting horizons, and the improved robustness of the forecasts to the randomness contained across time origins.

10:50 - 11:35 **DSGE MODELS** Room Tufts

Chairperson: Fred Ogli Iklaga, Central Bank of Nigeria

FORECASTING PERFORMANCE OF A TWO-COUNTRY DSGE MODEL OF THE EURO AREA AND THE UNITED STATES: THE MERITS OF DIVERGING INTEREST-RATE RULES

Ulrich Gunter, Austrian National Bank (OeNB)

We develop and estimate a small-scale DSGE model of the Euro area and the United States characterized by diverging interest-rate rules while using data from 1996Q2 to 2011Q2. These diverging rules reflect the different legal statutes of the ECB and the Fed, respectively. Due to its paramount objective of price stability, the ECB is supposed to conduct monetary policy by considering producer-price inflation only, whereas the Fed is assumed to conduct its policy by taking into account the output gap in addition to producer-price inflation.
We evaluate the out-of-sample forecasting performance of this model for prediction horizons one to four in comparison to the same two-country DSGE model but with identical interest-rate rules as well as two BVAR benchmarks. In terms of the root mean squared error, the DSGE model with diverging interest-rate rules outperforms the DSGE model with identical interest-rate rules for almost all variables across forecast horizons and compares well with the BVAR benchmarks, especially for US producer- and consumer-price inflation, and the terms of trade. For shorter horizons we find some statistically significant differences in forecast accuracy between rival models. For forecast horizons three and four the null of equal forecast accuracy can seldom be rejected.

DSGE-VAR MODEL FOR MONETARY POLICY ANALYSIS AND FORECASTING IN NIGERIA

Fred Ogli Iklaga, Central Bank of Nigeria
Co-Authors: Charles N. O. Modi, Emmanuel T. Adamgbe

The popularity of dynamic stochastic general equilibrium (DSGE) models as a framework for empirical macroeconomic analysis amongst policy makers at central banks is not in doubt. These econometric models combine micro and macroeconomic theory and are suitable for policy discussions notwithstanding their limitations particularly as a tool for producing competitive forecasts. In practical applications, DSGE models are scarcely parameterized to meet the requirements for core policy making. In this paper, an attempt is made at combining a stylized general equilibrium model with a vector autoregression (VAR) to obtain a specification useful for policy

analysis and to produce robust forecasts for the conduct of monetary policy in Nigeria. By adopting the methodology of Ingram and Whiteman (1994) and Del Negro and Schorfheide (2004) of imposing priors from a DSGE model on VARs as an efficient strategy for monetary policy analysis and forecasting, a similar framework is established for implementation at the Central Bank of Nigeria. Hence, the VAR is applied as a bridge between a DSGE model and the data. The DSGE-VAR model makes the fairly stylized New Keynesian DSGE model competitive in forecasting real output growth, inflation, and other key macroeconomic variables of interest to policy makers.

10:50 - 11:35 **ELECTRICITY DEMAND MODELLING A** Room Yarmouth
Chairperson: Luis Nunes, Nova School of Business and Economics

FORECASTING PORTFOLIO OF 'ELECTRICITE DE FRANCE' CUSTOMERS.
Xavier Brossat, EDF Research & Development
Co-Author(s): Anestis Antoniadis, Université Joseph Fourier Grenoble, Jairo Cugliari, INRIA and Jean-Michel Poggi, Université Orsay

Since the opening of the electrical market in France, EDF has had to forecast the electrical consumption of its customers instead of all French consumption. The perimeter of EDF's portfolio is changing in relation to the mobility of its customers. So the signal to forecast becomes less regular and the operational methods using non linear scalar regression become inefficient.
Here, we present a model proposed by Antoniadis et al. (2006) that use a nonlinear autoregressive functional process (electrical demand is considered like a sequence of daily load curves). We will describe how to take into account the variations of EDf's portfolio in order to use this method in operational conditions. (the first works were presented at ISF 2011 / Prague).
The method uses the 'Discrete Wavelet Transform' to both represent the daily curves demand and to construct a dissimilarity measure between curves. Then, the dissimilarity measure is plugged in into a kernel function in order to construct the predictor. Since the predictor works appropriately on strictly stationary functional series, some methods to obtain stationary data using clustering analysis based on wavelet transforms are used. An analysis of the sensibility of the predictor's elements to measure their incidence is performed. The obtained model is a suitable parsimonious alternative to the operational model.

DAY-AHEAD RESIDUAL DEMAND CURVE FORECASTING IN ELECTRICITY MARKETS
José Portela, Universidad Pontificia Comillas
Co-Author(s): Estrella Alonso Pérez, Universidad Pontificia Comillas and Antonio Muñoz San Roque, Universidad Pontificia Comillas

Any company selling or buying electricity in the day-ahead electricity market may be interested in modeling the competitive behavior of its competitors. This can be done using residual demand curves. For every hourly auction, the residual demand is defined as the clearing price of the market expressed as a function of the amount of energy the agent is able to buy or sell. Forecasting residual demand curves is the first and essential step in the design of optimal bidding strategies.
In order to predict the functional response, this paper follows two different approaches. The first approach applies both linear and nonlinear dimensionality reduction techniques to the residual demand curves. A multivariate time series model

is used to forecast the reduced components which are used to reconstruct the estimated curve. The second approach is based on the application of functional data analysis techniques by considering the sequence of residual demand curves as a functional time series.
An empirical comparative study is presented. Both methods will be used to forecast the hourly residual demand curves of the Spanish day-ahead electricity market. Exogenous variables are included in the models so as to achieve a more accurate solution.

10:50 - 11:35 **FORECASTING USING COMMON FEATURES A** Room Simmons
Chairperson/Organizer: Joao Issler, Graduate School of Economics - FGV

FORECASTING WITH JUDICIOUSLY CHOSEN VARS
Farshid Vahid, Monash University

It has been well documented that models with a large number of predictors are the only ones that can forecast the US GDP growth rate and inflation rate significantly better than univariate time series models. However, the selection of the set of predictors and the issue of the determination of lag length for each predictor has not been fully investigated. In this paper we use a combination of LARS (least angle regression and shrinkage) and a Bayesian variable selection method to address the issue of predictor and lag selection.

FORECASTING REALIZED COVARIANCES UNDER COMMON FACTOR RESTRICTIONS
Alain Hecq, Maastricht University
Co-Author(s): Sebastien Laurent, Maastricht University and Franz Palm, Maastricht University

This paper investigates to what extent the presence of common factors helps for forecasting the realized covariance matrix. We use a common feature approach where the time varying volatility feature is exclusively in the common component and not in the idiosyncratic part. We rely on a realized covariance framework, and some of its robust versions. We extend Anderson and Vahid (2007) by first considering all the unique elements (vech) of the realized covariance matrix and not only the realized variances. Second we consider a complete VARMA system for the vech of the realized covariance matrix and not only a VAR. Finally we apply a robust Wald test to detect the number of factors instead of a canonical correlations analysis. Monte-Carlo simulations show that the robust Wald test is more appropriate than the standard canonical correlation test when applied to volatility proxies, that are by construction heteroscedastic. Similarly to Anderson and Vahid (2007), we also consider estimates of the integrated covariance that are robust to jumps. This is applied on out-of sample forecasts on US stock returns.

10:50 - 11:35 **GOVERNMENT FORECASTING A** Room Salon H
Chairperson: Jean Eudes Biem, Harvard University

REVIEWING BUSINESS PROCESS MODELING AND REENGINEERING METHODOLOGIES AND FORECASTING THE EFFECTIVENESS OF BPR IN PUBLIC SECTOR
Michaela Kastanoulia, Forecasting and Strategy Unit, National Technical University of Athens
Co-Author(s): Vassilios Assimakopoulos, Forecasting and Strategy Unit, National Technical University of Athens and Konstantinos Nikolopoulos , Bangor Business School

The purpose of this research is to investigate the application of business process reengineering in public sector. Important role in this process play information and communication technologies which enable and lead to a new, e-government model, affecting thus the provision of services to all related agencies, inward and outward the organization. We are reviewing business process modeling and reengineering methodologies, techniques and case studies in the public sector. We are seeking to map business processes and implement business process reengineering to selected processes, according to set criteria and taking into consideration the particularities of the public sector, to predict the effectiveness of the proposed changes.

PLANNING AND FORECASTING ECONOMIC TRANSITION IN AFRICA BY 2035: A COMPARATIVE EVALUATION
Jean Eudes Biem, Harvard University

Planning and forecasting give contradictory perspectives on Africa's economic transition. First, relying on slow transition models, Africa's partners and lenders traditionally focus on macroeconomic aggregates, extrapolate short-term GDP growth prospects, and fail to forecast industrialization. Second, an emerging trend confirms that the continent may be on the verge of transition, with increasing revenues from rising raw materials prices that create increasing and potentially solvent demand in food, clothing, energy, infrastructure and equipment, automobile, NTIC products, all of which can support industrialization in the long term. Simultaneously, while implementing policies prescribed by partners and lenders to fulfill the Millennium Development Goals, a few African leaders are designing investment tracks toward industrialization. However, such planning is often prescriptive, based on political voluntarism, rather than rigorous forecasting. Conversely, even the emerging trend in forecasting seldom accounts for the potential impact of projects.
To bridge the gap, this paper will attempt an innovative, more rigorous forecasting of Africa's industrialization through a double set of comparisons: within and between forecasts and projects. Methodologically, results will expectedly be maximized by a combination of data mining and forecasts comparison that gives particular consideration to the strategy which, combining planning and forecasting, initially set the 2035 target.

10:50 - 11:35 **MODELLING AND ANALYSING DATA REVISIONS A** Room New Hampshire

Chairperson/Organizer: Rosa Teresa Ruggeri Cannata, Eurostat - European Commission

AN AREA WIDE REAL TIME DATA BASE FOR THE EURO AREA

Michele Modugno, Universite' Libre de Bruxelles - ECARES
Co-Author(s): Domenico Giannone, Université Libre de Bruxelles - ECARES, Jérôme Henry, European Central Bank and Magdalena Lalik, European Central Bank

This paper describes in detail a real time database for the euro area that we constructed and covers more than 200 series regularly published in the European Central Bank Monthly Bulletin, as made available before publication to the Governing Council members for their first meeting of each month. We study the properties of the euro area real-time data flow and data revisions, also comparing with the United States and Japan. We finally illustrate how such revisions can contribute to the uncertainty surrounding key macroeconomic ratios and the NAIRU.

SOURCES OF REVISIONS OF SEASONALLY ADJUSTED REAL-TIME DATA

Jens Mehrhoff, Deutsche Bundesbank

Generally, revisions of seasonally adjusted real-time data have two main sources which are interrelated. One of these sources is the technical procedure of the method used for seasonal adjustment: the release of new unadjusted data, old unadjusted data remaining unchanged, leads to a shift of the base period and a change in the weights of the smoothing filters. The other source is the revision process of unadjusted data in real time: on their first date of release the data contain estimates for missing values which will be updated by and by with actual figures.
The decomposition of sources of revisions revealed that a large influence on total revisions of euro-area GDP volume growth can be ascribed to revisions of unadjusted real-time data in the short run. This is consistent with the increasing availability of short-term “hard” data sources over subsequent releases. In the longer run, unadjusted data tend to be revised less, and seasonal filters revisions thus gain more relevance. While unadjusted data are no longer revised at some point in the future, seasonal adjustment generates revisions long after that.

10:50 - 11:35 **RECESSION FORECASTING A** Room Maine

Chairperson/Organizer: Jeremy Nalewaik, Federal Reserve Board

FORECASTING RECESSIONS USING STALL SPEEDS

Jeremy Nalewaik, Federal Reserve Board

This paper presents evidence that the economic stall speed concept has some empirical content, and can be moderately useful in forecasting recessions. Specifically, output tends to transition to a slow-growth phase at the end of expansions before falling into a recession, and the paper designs Markov-switching models that behave in that way. While the switching models using output growth alone produce a considerable number of false positive recession signals, adding the slope of the yield curve, the percent change in housing starts, and the change in the unemployment rate to the model reduces false positives and improves recession forecasting. The switching model is particularly good at forecasting at long horizons, outperforming Blue Chip consensus forecasts.

DETECTING RECESSIONS WITH FINANCIAL INDICATORS

Travis Berge, Federal Reserve Bank of Kansas City

This paper presents a framework for forecasting business cycle turning points using a methodology designed to extract an economic activity index from a wide-range of financial indicators. The methodology—developed in the machine learning literature and known generically as boosting—is extremely flexible, allowing for non-linear relationships between the predictors and the dependent variable, which can be either continuous (e.g., real GDP) or discrete (e.g., an indicator of the state of the business cycle). Acknowledging that the predictive information contained in any given indicator may change over time, the relationship between independent and dependent variables evolve as the model receives new information. The analysis focuses on the ability of the index to forecast business cycle turning points out-of-sample and at several different horizons into the future.

10:50 - 11:35 **SALES A** Room Hyannis
Chairperson: Masaya Murata, NTT Cyber Solutions Laboratories

NMIMS University. FORECASTING THE DECISION OF A FIRM: WHEN TO LITIGATE THE PATENT'S EXPIRY DATE AND WHEN TO INTRODUCE NEXT INNOVATION
Kalyanaram Gurumurthy

Firms (in pharmaceutical, technology and other areas) often patent their innovations. Patents are protected by law for a certain length of time. During this time-period, the firm enjoys monopoly. However, around the patent's expiry date the firm often engages in litigation asserting its intellectual property rights to extend its monopolistic regime. However, this effort to litigate the patent's expiry date comes at a cost, the litigation and human costs. The managerial question is: whether such litigation costs are worth incurring? Accordingly, the central research questions are:
(1) When should a firm litigate to extend patent's expiry date, and thus try and extend its monopolistic regime?
(2) When should the firm introduce the next innovation (new product or drug) without litigating?
We build a parsimonious analytical model to answer these research questions. The insights from the model are enriched by treating the next generation innovation as a probabilistic event. Employing this model, we perform numerical analyses to explicate the conditions under which litigation is better, and other conditions when introduction of the next innovation is better. Our model and the numerical study provide several interesting insights useful for academics and practitioners in business, life-sciences and technology domains.

THE EFFECT OF ANNOUNCEMENTS ON FORWARD-LOOKING BEHAVIORS FOR A HANDHELD VIDEO CONSOLE GAME MARKET
Hyungsoo Lim, KAIST BUSINESS SCHOOL
Co-Author(s): Duk Bin Jun, KAIST Business school and Dong Soo Kim, KAIST BUSINESS SCHOOL

During several decades, forward-looking behaviors for purchasing products have been actively discussed in marketing and demand forecasting literature. Forward-looking purchase behaviors basically stem from uncertainty of information. Particularly, uncertainty of future prices has been most frequently handled in literature as a key driver of the behaviors. However, in certain markets, such as mobile phone and console game markets, consumers' forward-looking behaviors tend to dramatically change by an announcement about new product information. We point out this tendency; in this study, we propose a structural model to capture stepped changes caused by announcements. The model offers demand forecasts that reflect the stepped changes in forward-looking behaviors given an announcement plan. Moreover, we incorporate the indirect externality that innately exists in hardware and software markets of systematic goods, such as CD players and video console games, into the proposed model and apply it to handheld video console sales and superstar games of the consoles in Japan. We expect that the proposed model is helpful to practitioners who develop and manage marketing plans.

11:40 - 12:25 **THE FORECASTING PROCESS 3** Room Wellesley
Chairperson/Organizer: Len Tashman, Editor of Foresight

TRACKING AND EVALUATING FORECAST ACCURACY
Jim Hoover, Accenture

The desire to improve forecast accuracy is a principal factor behind ERP systems. While much attention has been paid to measuring forecast accuracy for individual items, I've seen little attention to the challenges of tracking accuracy over time, especially for item aggregates. Some surveys have found that barely half the companies had created a formal procedure to measuring and tracking forecast accuracy. In this presentation, I discuss the obstacles companies have faced in tracking accuracy over time and offer a template for developing a coherent tracking system. Such a system should provide a "forecasting autopsy" with explanations for failing to meet accuracy targets and identifying routes to improvement.

11:40 - 12:25 **ELECTRICITY DEMAND MODELLING B** Room Yarmouth
Chairperson: Luis Nunes, Nova School of Business and Economics

WEATHER-RELATED UNCERTAINTIES IN ELECTRICITY GENERATION FOR RISK MANAGEMENT AND MULTI-STEP FORECASTS/SIMULATIONS ASSESSMENT
Virginie Dordonnat, EDF R&D
Electricite de France (EDF) is the major competitor in the French electricity market. The company produces and sells electricity to other market participants as well as to end-use customers and therefore manages uncertainties related to both electricity production and demand. Most uncertainties are related to future weather conditions. For the short-term horizon, ensemble forecasts from meteorological models are used. These forecasts are usually assessed for each forecasting horizon separately. For further horizons, we generate paths from statistical models estimated on historical data. Probabilistic distributions for each time-step can also be evaluated but real data as well as simulations are not independent and we have to assess dynamics as well. In both cases, we therefore need a validation method for multi-step forecasts/simulations. We discuss this issue and present a jackknife-based method developed for the assessment of our models outputs.

FORECASTING CONSUMER BENEFITS FROM SMART METER ROLL-OUTS
Luis Nunes, Nova School of Business and Economics
Electricity and gas smart meters and smart grids are being rolled out in a number of countries, including the USA, Canada, Australia, and several countries in Europe. Typically, these roll outs require huge investments in several new technologies whose overall benefits are still uncertain. Consumer behavior trials are particularly important to ensure that at the end, the best options are selected and that overall benefits to consumers and to society exceed total costs. This requires forecasting the benefits of the rollout of a project at state or national levels based on the results of trials which are limited in many dimensions such as size, time, socio-economic

characteristics, and geography. In this paper we show how the benefits in terms of energy efficiency observed on a specific consumer behavior trial can be forecasted to a large scale by incorporating social, economic, demographic, and climate variables in a prediction model of average treatment effects. We illustrate our methodology using data from electricity smart metering trials that were conducted in a number of European countries.

11:40 - 12:25 **FORECASTING USING COMMON FEATURES B** Room Simmons

Chairperson/Organizer: Joao Issler, Graduate School of Economics - FGV

FORECASTING ASSET PRICES USING PRESENT-VALUE-MODEL RESTRICTIONS

Joao Issler, Graduate School of Economics - FGV
Co-Author(s): Osmani Guillén, Central Bank of Brazil and IBMEC-Rio

Recent research have shown that variables in present-value models obey serial-correlation common features of the weak form, entailing short and long-run restrictions; see Hecq and Issler (2012). Cointegration imposes the transversality condition allowing to discard the limit I(0) combination in present-value models (PVMs). Short-run restrictions arise because the existence of an unforecastable linear combination of the I(0) series in the difference equation generating the PVM is crucial to guarantee the proper dynamic behavior of the variables in it. Since we need both conditions to validate PVMs, it is ideal to work with an integrated econometric framework, which is what the toolkit of common features offers; Vahid and Engle (1993, 1997), Cubadda and Hecq (2001), Vahid and Issler (2002), Hecq et al. (2006), and Athanasopoulos et al. (2011).
Here, we ask whether or not imposing theoretical restrictions entailed by PVMs helps to forecast asset prices. We compare three types of models: where no PVM restrictions are imposed; where only long-run restrictions are imposed, and where short- and long-run restrictions are imposed. For the latter, the setup of Athanasopoulos et al. (2011) is used, where a two-step model selection procedure jointly selects lag length, cointegrating rank and cofeature rank of the system.

CONSTRUCTING OPTIMAL DENSITY FORECASTS FROM POINT FORECAST COMBINATIONS

Luiz Lima, The University of Tennessee
Co-Author(s): Wagner Gaglianone,

Decision makers often observe point forecasts of the same variable computed, for instance, by commercial banks, IMF, World Bank, but the econometric models used by such institutions are unknown. This paper shows how to use the information available at point forecasts to compute optimal density forecasts. Our idea builds upon the combination of point forecasts under general loss functions and unknonwn forecast error distributions. We use real-time data to forecast the density of future inflation in the U.S. and our results indicate that the proposed method materially improves the real-time accuracy of density forecasts vis-à-vis the ones obtained from the (unknown) individual econometric models.

11:40 - 12:25 **GOVERNMENT FORECASTING B** Room Salon H

Chairperson: Michaela Kastanoulia, Forecasting and Strategy Unit, National Technical University of Athens

RATIONALITY OF DIRECT TAX REVENUE FORECASTS : EVIDENCE FROM SWISS CANTONS

Florian Chatagny, ETH Zurich, KOF Swiss Economic Institute

The current debt crisis has shed light on the importance of accurate fiscal forecasts. Furthermore, with the increasing number and strength of fiscal rules to tackle debt and deficit problems, the accuracy of revenue forecasts becomes particulary central since they set the limit within which expenditure should remain in order to reach fiscal balance. Therefore, forecasting tax revenue accurately is a key step in the implementation of sound fiscal policies. The current paper contributes to the empirical literature on the accuracy of fiscal forecasts by providing new evidence about Swiss cantons. Using panel data on 26 Swiss cantons over 1945-2007, the rationality of direct tax revenue forecasts is tested. Assuming symmetric losses, we mainly show that 1) actual tax revenue are systematically underestimated on average 2) forecasts often fail to incorporate available information efficiently. Assuming asymmetric loss function, we apply the method developed by Elliott et al. (2005) in order to back out the paramaters of a potentially asymmetric loss function. We then run the rationality test suggested by Elliott et al. (2005) and expect to mitigate the results found under symmetric losses.

IMPACT OF THE U.S. GOVERNMENT'S SPENDING IN MAJOR ENTITLEMENT PROGRAMS ON ECONOMIC GROWTH AND VICE-VERSA: A VAR ANALYSIS

Charles Datta, Summit Consulting LLC
Co-Author(s): Albert Lee, Summit Consulting, LLC

This paper intends to forecast the impact of increased government spending in top three government’s entitlement programs- social security, medicare and medicaid, on GDP per capita and vice-versa for the U.S. economy. Vector Auto Regression (VAR) models will be developed to estimate and forecast the strategic interdependency between these three entitlement programs and GDP per capita in the presence of policy, demographic and macroeconomic factors. Unit Root and Granger Causality Tests will be performed to test for stationarity and direction of causality between the various factors. Potential endogeneity issues will be addressed by employing suitable instrumental variables. The paper will use the U.S. Government’s public budget database to perform this analysis. Using the forecasted models, the paper will provide dynamic scenario analysis such as possible short- and long run impacts of changes in demographic structure on the entitlement programs and economic growth. The paper will conclude with some future policy suggestions based on this analysis.

11:40 - 12:25 **MODELLING AND ANALYSING DATA REVISIONS B** Room New Hampshire

Chairperson/Organizer:: Rosa Teresa Ruggeri Cannata, Eurostat - European Commission

IMPROVING REAL-TIME ESTIMATES OF OUTPUT GAPS AND INFLATION TRENDS WITH MULTIPLE-VINTAGE MODELS.

Ana Beatriz Galvao, Queen Mary University of London
Co-Author(s): M Clements, University of Warwick

Real-time estimates of output gaps and inflation trends differ from the values that are obtained using data available long after the event. Part of the problem is that the data on which the real-time estimates are based is subsequently revised. We show that vector-autoregressive models of data vintages provide forecasts of post-revision values of future observations and of already-released observations capable of improving real-time output gap and inflation trend estimates. Our …findings indicate that annual revisions to output and inflation data are in part predictable based on their past vintages.

MODELLING MULTIVARIATE REVISIONS IN A COINTEGRATED VECTOR AUTOREGRESSIVE MODEL

Rosa Teresa Ruggeri Cannata, Eurostat - European Commission
Co-Author(s): Riccardo Gatto, European Commission - Eurostat, Alain Hecq, Maastricht University and Gian Luigi Mazzi, European Commission - Eurostat

After extracting the most important features of different vintages composing the data revision process, it emerges that the nons-tationarity and the presence of autocorrelation are the two most dominant characteristics of these time series. We look whether these features are common to several variables, by carrying out a common trend/common cycle analysis with the goal to finding the timing with which an indicator is close enough to the "real thing". We propose two ways of splitting a real-time data set: considering successive vintages of the same phenomenon and looking at real-time releases. We try also to answer the three questions: do different vintages (diagonals and verticals in our study) share the same long-run movements? Do different vintages share the same short-run movements? Should we use one or a combination of different vintages? We show that series coming from the same multivariate system and sharing co-movements must have the same parsimonious individual ARMA representation. This shall help us in selecting the best combination of vintages. An application on real EU monthly industrial production index. is presented.

11:40 - 12:25 **OIL PRICES** Room Tufts

Chairperson: Xun Zhang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences

OIL PRICES AND INFLATION IN THE EURO AREA AND ITS MAIN COUNTRIES: GERMANY, FRANCE, ITALY AND SPAIN

Cesar Castro Rozo, Student
Co-Author(s): Pilar Poncela, Professor, Dept. Análisis Económico : Economía Cuantitativa . Universidad Autónoma de Madrid, Pilar Poncela, Professor and Eva Senra, Professor, Dept. Estadística, Estructura Económica y O.E.I. Universidad de Alcalá

Oil is one of the most important commodities to determine variations on inflation. However, there is no consensus in the literature about the type of effect and when this is detected. Oil price increases on inflation can show first and second round effects. On the aggregate, these effects may partially cancel out. Only through a disaggregated approach, we are able to distinguish among all types of effects. Furthermore, the disaggregated approach let us identify in what sectors there is a loss of competitiveness due to oil price shocks and to increases in commodity prices. To characterize these effects we use multivariate transfer function models with commodity prices and measures of the demand pressures as inputs on a group of non-administered harmonized consumer prices indices for the euro area and its main partners. Variations in oil prices do not need to hit all the economies in a similar way so, we look for goods and services that increase the inflation of a certain country due to oil shocks. We also address non linearity issues by taking into account asymmetric effects regarding large positive variations of oil prices. We perform a forecasting exercise conditional on several scenarios about the oil shocks.

FORECASTING TURNING POINTS OF CRUDE OIL PRICES BASED ON MARKOV SWITCHING MODELS WITH TIME-VARYING TRANSITION PROBABILITIES

Xun Zhang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences
Co-Author(s): Shouyang Wang, Academy of Mathematics and Systems Science, Chinese Academy of Science and Jiawei Zhang, Academy of Mathematics and Systems Science, Chinese Academy of Science

In this study, Markov switching models with time-varying transition probabilities (MS TVTP) are proposed to forecast the turning points of crude oil prices. The transition probabilities of increasing and decreasing states of crude oil prices are assumed to be dependent on the crude oil price cycle durations and a leading index of crude oil prices. The durations are obtained via Bry-Boschan turning point detection algorithm and SiZer method. The leading index is a composition of U.S. crude oil inventory, OECD leading indicator for U.S., and net non-commercial long positions on Nymex WTI. West Texas Intermediate (WTI) crude oil spot price and Brent crude oil spot price, are used to test the effectiveness of the MS TVTP models. Empirical results obtained demonstrate attractiveness. Among the three models, the duration dependent model is more effectively than leading index dependent model, and the performance of both duration and leading index dependent model is between the above two models.

11:40 - 12:25 **RECESSION FORECASTING B** Room Maine

Chairperson/Organizer:: Jeremy Nalewaik, Federal Reserve Board

CONFRONTING MODEL MISSPECIFICATION IN MACROECONOMICS

Daniel Waggoner, Federal Reserve Bank of Atlanta
Co-Author(s): Tao Zha, Federal Reserve Bank of Atlanta and Emory University

We estimate a Markov-switching mixture of two familiar macroeconomic models: a richly parameterized DSGE model and a corresponding BVAR model. We show that the Markov-switching mixture model dominates both individual models and improves the fit considerably. Our estimation indicates that the DSGE model plays an important role only in the late 1970s and the early 1980s. When the BVAR model is of reduced form, the mixture model can be used as a data filter for the estimation of the DSGE model. When the BVAR model is structural, we show how to compute the impulse responses to the same type of shock shared by the DSGE and BVAR models. Our exercises demonstrate the importance of integrating model uncertainty and parameter uncertainty to address potential model misspecification in macroeconomics.

FORECASTING THE GLOBAL RECESSION IN ADVANCED ECONOMIES

Daniela Bragoli, Università Cattolica, Piacenza, Italy

Did the information on the structural macroeconomic indicators available up to 2007 help predict the Global Recession of 2008-2010?
We conduct an out of sample exercise focusing on the experience of the G7 economies exploiting both the times series and the cross section dimensions. We compare country by country performances with models in which we pool the different countries' experiences. In both cases we test whether the information up to 2007 on the structural macroeconomic variables, typically suggested by the Early Warning Literature, helped predict the decline in Real GDP growth in the crisis period (2008, 2009, 2010). We find that, at short horizons, it is possible to predict the incidence of the crisis across countries, the combined forecast across models outperforms the benchmark of non predictability and pooling helps in providing better results especially at longer horizons.
The paper lends support to the idea that the Global Recession was not a fully unpredictable phenomenon and that a common driver indeed existed.

11:40 - 12:25 **SALES B** Room Hyannis
Chairperson: Masaya Murata, NTT Cyber Solutions Laboratories

NEW PRODUCT FORECASTING WITH ANALOGS -- DOES THE UPTAKE CURVE OF PHARMACEUTICALS DIFFERS FOR REGION?

Christian Schaefer, Boehringer Ingelheim GmbH
Co-Author(s): Daniel Porath, University of Applied Science Mainz

The Bass model is the common industry standard for forecasting sales volume of newly launched pharmaceuticals. This is mainly motivated by its good predictive power in the past, in spite of the fact that the model is not designed for predicting sales of pharmaceuticals. Past experience, however, mainly refers to mature markets. But it is unclear how the model behaves in emerging markets. This study contributes to fill this gap in the literature. We compare the performance and the estimated coefficients of the Bass model between emerging and mature markets using a dataset of more than 5,000 new launches from different countries and therapeutic classes. Our results show a good performance of the model in emerging markets. Compared to mature markets the estimated parameters on average are the same, but there is a higher heterogeneity between individual countries. Our findings favor the application of the Bass model in emerging markets, but also highlight the importance of selecting individual parameters for each country and therapeutic class. As a rule of thumb one could summarize, that the sum of Bass model's parameters should be in the ballpark of 50%, when predicting pharmaceuticals. The innovation parameter generally is much lower than the imitation one.

SALES IMPACT SIMULATION FOR E-COMMERCE MARKETING PLANS

Masaya Murata, NTT Cyber Solutions Laboratories
Co-Author(s): Yusuke Ichikawa, NTT Cyber Solutions Laboratories, Noriko Takaya, NTT Cyber Solutions Laboratories and Tadasu Uchiyama, NTT Cyber Solutions Laboratories

Sales promotion is important for E-Commerce (EC) sites because it can dramatically enlarge daily sales and attract new customers. In planning a sales strategy, EC marketers often wonder what sorts of discounting, that is, the discount rates and the days that discounts are offered, would most impact total sales during the promotion period. To answer this question, we developed a statistical simulation for modeling the impact on sales that different discounting procedures have for EC sites. Our simulation model is composed of two elements: a time series analysis of the EC site's daily sales and a linear regression estimation of the sales' impact. Regarding the time series analysis, we modeled the 'sudden changes' component along with the trend and daily periodic fluctuations, and for the regression analysis, we extended Elastic Net so as to efficiently eliminate predictors that are indistinguishable from noises. Our model needs only the discounting procedures of essential brands as input data and outputs long-term daily sales predictions. In the experimental evaluation, we used an actual brands' discounting process for an upcoming winter sales promotion and compared the predicted sale amounts with the real ones. Overall prediction accuracy was decent, and this demonstrated the effectiveness of our model.

11:40 - 12:25 **TIME SERIES MONITORING** Room Boston Univ
Chairperson: Nicos Pavlidis, Lancaster University Management School

MONITORING FORECASTING SYSTEMS -- REVISIT TRIGG'S TRACKING SIGNAL
Yikang Li, Micron Technology
Co-Author(s): Mike Lange, Micron Technology and Cody Stock, Micron Technology

Time series forecast monitoring methods, such as the Brown and Trigg tracking signals, have been widely used to ensure that the underlying forecasting systems remain in control. After Brown's initiation in 1959, Trigg (1964) improved the tracking signal. First, if the forecasting system starts to give exceptionally accurate forecasts, the tracking signal will not continue to degrade. Second, Trigg claimed the new tracking signal no longer needed resetting in order to avoid a false warning signal. However, in this study we found there are two shortcomings with Trigg's tracking signal. First, it may actually need frequent resetting in cases where forecast errors were out of control and then significantly reduced. Additionally, Trigg's tracking signal will send false warning signals if a forecasting system transitions from an unbiased system with a large standard deviation of forecast errors to a biased system with a small standard deviation of forecast errors. We propose a new tracking signal – Complementary Tracking Signal (CTS) and show that this new measure overcomes the shortcomings of Trigg's tracking signal. Secondarily, we prove that if the current absolute value of relative error is less than previous absolute value of the CTS, then the CTS is improving through time.

MONITORING GARCH MODELS OVER TIME
Nicos Pavlidis, Lancaster University Management School
Co-Author(s): Efthymios Pavlidis,

Generalised Autoregressive Conditional Heteroskedasticity (GARCH) models are widely used in the study of financial time series. GARCH models can account for the well known fact that volatility in asset returns fluctuates over time. This is important as volatility constitutes a measure of risk. It is known that GARCH models fit very poorly long sequences of financial data.

We present an adaptation of an approach originally proposed byWhittaker et al. (2007) to monitor scorecard performance, to the problem of monitoring the performance of a GARCH model over time. The approach relies on formulating a state-space representation for the dynamics of the GARCH model and tracking its evolution through a particle filter. Through bootstrapping we can obtain tolerance limits under the hypothesis that the estimated GARCH model is static over time. We present preliminary results using the daily time series of NASDAQ that indicate that a static model for the conditional variance is not supported by the data.

13:35 - 14:35 **THE FORECASTING PROCESS 4** Room Wellesley
Chairperson/Organizer:: Len Tashman, Editor of Foresight

FORECAST PROCESS DESIGN AND CHANGE MANAGEMENT
Simon Clarke, Coca-Cola Refreshments and Joe Smith, Dean Foods

Many companies have improperly prioritized the three crucial elements of the forecasting process: People, Process, and Tools. These companies are too eager to focus on tools as the solution that will bring them cost savings and revenue improvement. In truth, the glue that holds everything together across business functions is people and process. Good process design is a prerequisite to optimize forecast performance and assure reliability. In this talk, we offer design recommendations and share our lessons in implementation of a new forecasting process at Coca Cola.

13:35 - 14:35 **IJF EDITOR INVITED PAPER** Room Simmons
Chairperson: Rob Hyndman, Monash University
Organizer: Rob Hyndman, Department of Econometrics & Business Statistics, Monash University

PREDICTABILITY AND INSIGHT: CONTRASTING THE ACHIEVABLE AIMS OF FORECASTING IN WEATHER-LIKE CASES AND CLIMATE-LIKE CASES
Leonard Smith, London School of Economics

The aims, means, and outputs of forecasts for decision support vary with the nature of the system, our level of understanding, and the nature of the decisions being made. That which constitutes good practice in one case may be disadvantageous (indeed irrational, if not impossible) in another. In many cases one has an insightful prior probability distribution on the likely outcomes (the relevant climatology) and a large archive of forecast/outcome pairs. In this "weather-like" case the lifetime of a model is very long compared to the decision-relevant lead-time of a forecast. Contrast that case with a "climate-like" case in which the forecast/outcome archive is at best small, the lifetime of a model is much less than the lead-time of the forecast, and it is questionable whether or not past observations provide a relevant prior. While probabilistic weather and climate forecasts will be used for concreteness, the weather-like/climate-like distinction is useful outside of the Earth sciences and arguably across the entire spectrum of forecast and modelling activities. Clarifying this distinction throws some light on the friction commonly observed between proponents of "physical insight" and "statistical good practice" when forecasting the real world. The roles both of model inadequacy and of uncertainty in observations (and parameters) are shown to differ in the two cases; distinct challenges to the rationality of probability forecasts (used as such) for decision making raised in each case, and the possibility of replacing "fair odds" with "sustainable odds" is illustrated and argued for. The diversity of our models provides different information in weather prediction than in climate projection, but in neither case does it quantify the uncertainty in our future. How then are we to judge, constructively criticize, and improve operational forecasting and the models which underly it?

13:35 - 14:35 **FORECASTING THE 2012 U.S. PRESIDENTIAL ELECTION** Room New Hampshire

Chairperson/Organizer: Andreas Graefe, LMU Munich

"IT'S THE ECONOMY STUPID," BUT CHARISMA MATTERS TOO: A DUAL-PATHWAY MODEL OF PRESIDENTIAL ELECTION OUTCOMES.

Philippe Jacquart, Wharton School, U. of Penn
Co-Author(s): John Antonakis, University of Lausanne

Because charisma is assumed to be an important determinant of effective leadership, the extent to which a presidential nominee is more charismatic than his opponent should be an important determinant of voter choices. We computed a composite measure of the rhetorical richness of acceptances speeches given by U.S. presidential candidates at their national party convention. We added this marker of charisma to Ray C. Fair's presidential vote-share equation (1978; 2009). We theorized that voters decide using psychological attribution (i.e., due to macroeconomics and incumbency) as well as inferential processes (i.e., due to leader charismatic behavior) when voting. Controlling for the macro-level variables and incumbency in the Fair model, our results indicated that difference between nominees' charisma is a significant determinant of electoral success, particularly in close elections. This extended model significantly improves the precision of the Fair model and correctly predicts 23 out of the last 24 U.S. presidential elections.

ISSUE AND LEADER VOTING IN U.S. PRESIDENTIAL ELECTIONS

Andreas Graefe, LMU Munich
Co-Author(s): Scott Armstrong, Wharton School, University of Pennsylvania

This study presents a model for forecasting U.S. presidential elections that is built on a dominant American voting theory, according to which vote choice is strongly influenced by party identification, issues, and candidates. The model uses public opinion data from polls that ask voters about the importance of issues, which candidate they think can better handle the issues, and which candidate is the stronger leader. For the past four elections, the model's ex ante forecasts, calculated about two months prior to Election Day, were competitive with those from the best of eight political economy models. Model accuracy substantially improved over the course of the campaign. The Election Eve forecasts of the model missed the actual vote shares only by about one percentage point. The results suggest that campaigns matter for the outcome of U.S. presidential elections. The direct influence of party identification was found to decrease over the course of the campaign, whereas issue and candidate evaluations gradually gain importance. Issue evaluations are about twice as important as candidate evaluations for predicting the election result. The model has decision-making implications for campaign strategies. Candidates should engage in agenda setting and should try to increase their perceived issue-handling and leadership competence in order to gain votes.

THE KEYS TO THE WHITE HOUSE: FORECAST FOR 2012
Allan Lichtman, Amercan University

The Keys to the White House are a historically-based prediction system that retrospectively account for the popular-vote winners of every American presidential election from 1860 to 1980 and prospectively forecast well ahead of time the popular-vote winners of all presidential elections from 1984 to 2008. The Keys give specificity to the theory that presidential election results turn primarily on the performance of the party controlling the White House and that politics as usual by the challenging candidate will have no impact on results. The Keys combine both quantitative and judgmental indicators. They include no polling data and consider a much wider range of performance indicators than economic concerns. Already, the Keys are lining up for 2012, showing how changes in the structure of politics favor a Democratic victory. Unlike other systems, however, the keys specify what changes in circumstance could alter the forecast. The Keys show that it is governing, not campaigning, that counts in deciding presidential elections. No party has an enduring hold on the American presidency. Moreover, political leaders need not move to the ideological center. As demonstrated by presidents such as Franklin Roosevelt and Ronald Reagan, a strong ideology can guide domestic and foreign policy initiatives that keep in line the keys needed to retain the White House. Given that campaigns don't decide elections, the Keys model also indicates that candidates should abandon conventional politics and develop the themes, issues and grassroots support needed for effective governance during the next four years.

13:35 - 14:35 **JUDGMENTAL FORECASTING FROM TIME SERIES** Room Yarmouth
Chairperson/Organizer: Nigel Harvey, University College London

ORDER EFFECTS IN JUDGMENTAL FORECASTING: HIGHER ACCURACY WHEN THE LAST OUTCOME IS FORECAST FIRST
Zoe Theocharis, UCL

A first experiment examined forecasting performance for various forecasting horizons (up to five time steps ahead) when series with different underlying signals were presented to participants. In line with expectations, better forecasting occurred for shorter forecasting horizons for all types of series. Nevertheless, a second experiment revealed that the magnitude of the error also depended on the forecasting task characteristics. Specifically, participants who were asked to forecast the next five points of a time series in the order in which the outcomes would occur were less accurate than those who were asked to forecast the same time series but starting with the outcome that would occur last. (Those in the latter condition were asked to make their forecast for the most distant point first and then to make forecasts for the remaining points in the order in which the outcomes would occur.). Forecasting the last outcome first appears to cause the signal in the series to dominate the forecasters' judgments and to reduce the noise that previous research has shown that forecasters introduce into their predictions.

DEPENDENCE OF JUDGEMENTAL PREDICTIONS ON FORECASTERS' PERSONALITY TRAITS AND PRICE SERIES FRACTAL CHARACTERISATIONS

Daphne Sobolev, UCL
Co-Author(s): Nigel Harvey, UCL

We report one experiment with 13 finance experts and another with 37 undergraduates. In both cases, people saw nonlinear time series labelled as stock prices. These differed in terms of their Hurst exponent (H), a measure of series autocorrelation and its stability over time. (Series with H > .5 have a long-term positive autocorrelation whereas those with H < .5 have a long-term negative autocorrelation.) Participants made forecasts, assessed the probabilities of these being accurate within a given range, and completed standardised personality questionnaire. Undergraduate participants also answered questions about their world views.
Average absolute values of gradients between successive predictions depended linearly on the Hurst exponent. We also correlated the average absolute values of gradients between successive predictions with average absolute values of gradients between successive data points. For experts, the level of these correlations was itself correlated with self-ratings of conscientiousness. For undergraduates, it was correlated with their self-ratings of emotional stability and with their views about predictability and the moral nature of other people. Experts' probability estimates of their forecasts being correct were correlated with their self-ratings of agreeableness and emotional stability. Implications of our findings will be discussed.

BARS, LINES, AND POINTS: THE EFFECT OF GRAPH FORMAT ON JUDGMENTAL FORECASTING

Nigel Harvey, University College London
Co-Author(s): Stian Reimers, City University, London

Information about variables that change over time is often presented in graphically. However, the manner in which data series are presented graphically may influence judgmental forecasts that people make from those series. We examined forecasts made from bar charts, line graphs, and unconnected points. In a first experiment, 1068 participants made forecasts for eight future outcomes that would follow a time series of 50 points. We used between-participant manipulations of level of series noise, type of underlying function in the presented series, and, crucially, graph format. We found that participants who saw data represented as bar charts made forecasts that were lower and that contained more noise than those who saw data as line graphs or unconnected points. Their forecast accuracy was significantly worse than that of those in the other two groups. People's forecasts may be drawn down towards the solid representation of data provided by bar charts. We report a second experiment designed to test this account in which the bars came down from the top of the graph rather than up from the bottom.

13:35 - 14:35 **QUANTILE FORECASTING** Room Tufts
Chairperson: Yuzhi Cai, Swansea University

STRESS ON TAIL QUANTILES
Juan-Angel Jiménez-Martín, Complutense Universtiy of Madrid
Co-Author(s): Gloria Gonzalez-Rivera, Department of Economics

We generalize the concept of Value-in-Stress (ViS) introduced by González-Rivera (2003) as a coherent measure of a firm's risk exposure. ViS is the expected change in the value of a firm under stressed economic and financial environments. Stressful scenarios are defined probabilistically by taking into account the degree and likelihood of stress provided by the joint distribution of risk factors. This approach differs from the standard strategy, which consists of selecting stress scenarios exogenously. In a dynamic framework, we extend ViS by estimating any expected quantile of the firm's value as a function of the risk factors. Our main focus lies on the tail quantiles. Similarly to ViS, we construct a measure of tail comovement between the firm's value and the risk factors under stress. We also generalize the dependence structure among risk factors beyond multivariate normality, which does not capture tail dependence. It is possible that two risk factors, say X and Y, contribute more to the overall risk of a company when they become large concurrently. Risk X and Y can be large because their probability distributions are heavy tailed but they can be independent. To identify the influence of dependence on the overall risk we need a dependence concept that is independent of the marginal distribution of the risks. We model factor dependence by choosing a copula function that will tie up the marginal distributions. Copulas offer great flexibility on capturing potential asymmetries in the tails of the joint distribution and can be applied to any marginal distribution of the risks. A forecast of the ViS for a tail quantile will be readily available once we obtain the multivariate predictive density of the risk factors.

FORECASTING QUANTILES, DENSITIES AND EXCEEDANCE PROBABILITIES USING THE ASYMMETRIC LAPLACE DENSITY
James Taylor, University of Oxford

Quantile regression has been used within several methods for forecasting the quantiles of a time series. It has been shown that maximising the likelihood function based on an asymmetric Laplace density is equivalent to quantile regression. An extension of this quasi-likelihood framework has been used for the simultaneous estimation of models for different quantiles across a distribution. We consider the role of the asymmetric Laplace density's scale parameter in this context, and evaluate the density forecasts resulting from exponentially weighted simultaneous quantile estimation. As an alternative to this, we introduce a density forecasting method involving a discount weighted regression spline. In many applications, a forecast is needed for the probability of a future observation exceeding a given threshold. We estimate models for the exceedance probability using quasi-likelihood based on an asymmetric Laplace and a Binomial density. Proposals put forward in the paper are evaluated using wind power and financial returns data.

FORECASTING FOR QUANTILE AR TIME SERIES MODELS
Yuzhi Cai, Swansea University
Co-Author(s): Neville Davies, Plymouth University and Julian Stander, Plymouth University

This paper proposes a Bayesian approach to quantile autoregressive (QAR) time series model estimation and forecasting. We establish that the joint posterior distribution of the model parameters and future values is well defined. The associated MCMC algorithm for parameter estimation and forecasting converges to the posterior distribution quickly. We also present a combining forecasts technique to produce more accurate out-of-sample forecasts by using a weighted sequence of fitted QAR models. A moving window method to check the quality of the estimated conditional quantiles is developed. We verify our methodology using simulation studies and then apply it to currency exchange rate data. The results obtained show that an unequally weighted combining method performs better than other forecasting methodology.

13:35 - 14:35 **UNCERTAINTY AND THE REAL-TIME BUSINESS CYCLE ANALYSIS 1** Room Maine
Chairperson/Organizer:: Gian Luigi Mazzi, Eurostat

NOWCASTING BUSINESS CYCLE TURNING POINTS IN AN UNCERTAIN ENVIRONMENT
Knut Are Aastveit, Norges Bank
Co-Author(s): Francesco Ravazzolo, Norges Bank and Herman van Dijk, Tinbergen Institute and Erasmus University Rotterdam

In this paper, we construct a combined Bayesian factor model to estimate and nowcast US business cycle turning points in real-time. Factor models are often used to construct business cycle indicators. Two approaches have mainly been used. The first approach is to identify turning points individually in a large number of series and then average (date then average). The second approach is to look for turning points in a few, or just one, aggregate (average then date). We study both approaches within a factor model framework. In the former approach we apply a nonlinear transformation to all the data series and then estimate factors. In the latter approach we estimate a single series, such as GDP, using factor models. We then apply a given rule, such as the Bry-Broschan (1971) algorithm, to the estimated series. In both approaches we propose to use a combined Bayesian factor model. An advantage of using model averaging is that we account for several sources of uncertainty such as parameter uncertainty and data input and factor structure uncertainty.

DETECTING EURO-AREA TURNING POINTS: DISAGGREGATED VERSUS AGGREGATED APPROACH
Gian Luigi Mazzi, Eurostat
Co-Author(s): Monica Billio, Ca Foscari University, Venice and Laurent Ferrara, Universite Paris 10

We propose probabilistic coincident indicators of business and growth cycles for the three largest Euroarea countries, Germany, France and Italy. These coincident indicators will allow us to perform a real-time analysis of the

economic cycles at country level and to compare at the Euroarea level an indirect turning points detection with the usual direct univariate and multivariate ones.
The growth cycle coincident indicators at country level proved to correctly identify the slowdowns of a reference dating chronology. By contrast we experienced some problems in compiling business cycles coincident indicators so that their degree of accuracy in identifying peaks and troughs of the respective dating chronology was not as satisfactory as in the case of the growth cycle. Furthermore, for both the growth and business cycles we showed that the variables and related model specifications used for the coincident indicators at the Euroarea level are not suited for dealing with the same cycles at country level.
Euroarea and countries indicators have been compared in real time over the last global financial and economic crisis and during the subsequent period of uncertainty for Euroarea economies. Some interesting results in term of timeliness and accuracy of turning points detecting have been reported.

USING REAL TIME DATA TO TEST FOR POLITICAL BUDGET CYCLES

Jan-Egbert Sturm, KOF, ETH Zurich
Co-Author(s): Jakob De Haan, and Richard Jong-a-Pin,

For Greece to enter the European Monetary Union in 2002 it had to fulfil the so-called Maastricht criteria. In particular, the deficit-to-GDP ratio needed to be below 3 percent. Early 2002 the official statistics reported a deficit of 1.4 percent in 2001. However, this was corrected to 3.7 percent in 2004. Greece statistics were manipulated for political reasons. Instead of focusing upon the entry into the EMU, we analyse a sample of 26 OECD countries and check whether first official releases of public finance data as published (in the OECD Economic Outlook) shortly before elections have subsequently been revised. Hence, we test whether political business cycles can be found in real time data and whether incumbent governments manipulate preliminary government statistics. Although we do not find evidence for this in the overall deficit figures, we do find clear support when looking at the expenditure and revenue sides. Our approach allows to distinguish between adverse selection and moral hazard types of models to describe the underlying political process.

13:35 - 14:35 **VARMA MODELS** Room Hyannis

Chairperson/Organizer: George Athanasopoulos, Monash University

AN AUTOMATED ALGORITHM FOR VARMA MODELS

George Athanasopoulos, Monash University
Co-Author(s): Farshid Vahid, Monash University and Wenying Yao, Monash University

In this paper we propose a fully automated algorithm for identifying and estimating parsimonious vector autoregressive moving average (VARMA) models. The algorithm is based on two steps. In the first step using model selection criteria we select a canonical reverse Echelon form VARMA specification by exploring all possible combinations of Kronecker invariants up to some order maximum order p. In the second step we reduce the number of free parameters again based on model selection criteria.

FORECASTING WITH EC-VARMA MODELS

Wenying Yao, Monash University
Co-Author(s): George Athanasopoulos, Monash University, Don Poskitt, Monash University and Farshid Vahid, Monash University

In this paper we propose an algorithm for identifying and estimating cointegrated vector autoregressive moving average (VARMA) models. First the cointegrating rank of the VARMA process is selected by an extended version of Poskitt (2000). This non-parametric selection procedure is completely independent of the functional forms of the model. We examine its finite sample property via Monte Carlo simulation. We also extend the iterative ordinary least squares (IOLS) procedure by Kapetanios (2003) to the non-stationary case to estimate the error correction VARMA (EC-VARMA) model. It is more computationally efficient than Gaussian nonlinear maximum likelihood estimation in large simulations. We evaluate the forecasting performance of such models which are identified and estimated by the proposed algorithm, for some pre-specified data generating processes (DGPs). The loss of using finite order vector error correction models (VECMs) is also shown in our simulation. Finally we apply this algorithm to model the term structure of U.S interest rates. The results reveal that the out of sample forecasts of the EC-VARMA model are superior to those produced by the VECM, especially in short horizons.

COINTEGRATED VARMA MODELS

Carlos Diaz, Universidad de Cantabria
Co-Author(s): Jose Luis Gallego, Universidad de Cantabria

We show how to embed the cointegration analysis into the Box-Tiao approach to the modeling and analysis of multiple time series. These authors warned about the danger of simultaneously overdifferencing several nonstationary series when there exist stationary linear combinations among them. We propose to detect this type of overdifferencing by extending the locally optimal tests for noninvertibility available in a general ARIMA model to the multivariate case. We also obtain their finite sample distributions so that the testing procedures are also powerful under the presence of unattended roots of high modulus. Furthermore, we describe how to estimate cointegration relationships and how to use the noninvertibility testing procedures to confirm their validity. Some examples are given.

14:40 - 15:25 **THE FORECASTING PROCESS 5** Room Wellesley
Chairperson/Organizer: Len Tashman, Editor of Foresight

A MANTRA FOR AUDITING FORECAST-PROCESS PERFORMANCE
Alec Finney, Rivershill Consultancy

Since a top-quality forecasting and planning process is the key to delivering good business performance,, it is important to periodically audit the process and determine what needs to change. A careful audit should draw out areas of satisfaction and unease and product full picture or what's right, what's wrong, and what might be missing: In this talk, we will discuss the three key elements of a forecast process audit:
• How good do we think we are?
• In reality, how good are we?
• How good should we strive to become

14:40 - 15:25 **CAPM AND RISK FORECASTING** Room Boston Univ
Chairperson: Muteba Mwamba John, University of Johannesburg

FORECASTING SYSTEMATIC RISK: EVIDENCE FROM TURKEY
Yonca Kalyoncu Ozener, University of Aberdeen
Co-Author(s): Ercan Balaban, University of Aberdeen

This paper primarily aims to evaluate the out-of-sample forecasting ability of such competing models as the Blume method and the Vasicek method for the stock beta coefficients, a measure of systematic risk. The former is estimated as a constant, a rolling and a recursive method. We use data from an emerging financial market of a middle-income European Union accession country, namely, Turkey. Betas are estimated and forecast for the daily, weekly and monthly frequencies. In addition, each frequency employs different estimation windows to be able to determine the optimum length. The two naïve methods, random walk and historical mean models, are used as benchmark forecast competitors. The out-of-sample forecast performance (both across companies and through time) is compared through the non-parametric error statistics, the symmetric and asymmetric parametric error statistics, forecast efficiency tests, and incremental information tests. The application-based tests such as index fund performance and short-long performance evaluations are also performed. Finally, the empirical results are discussed to derive implications for diverse areas of investment banking, particularly for portfolio management and risk management. .

Key Words: CAPM, Systematic risk, Beta, Forecasting, Forecast evaluation, Turkey, EU

THE EFFECT OF PROBABILITY AND UNCERTAINTY MODELS ON HEDGE FUND PERFORMANCE ANALYSIS
Muteba Mwamba John, University of Johannesburg

This paper implements two types of framework to analyse the outperformance, selectivity and market timing skills in hedge funds:

uncertainty and probability. Under uncertainty framework, the paper develops an uncertain fuzzy credibility regression in the form of a linear and quadratic CAPM in order to estimate these performance skills. Under probability framework, the paper implements two frequentist and Bayesian CAPMs (linear and quadratic) in order to estimate the same performance skills. We consider a data set of monthly investment strategy indices published by Hedge Fund Research group. The data set spans from January 1995 to June 2010. We divide this sample period into four overlapping sub-sample periods that contain different market trends. Under probability framework, our results show that bounded rationality triggers inefficiencies in the market that fund managers can utilise to outperform the market. This market outperformance is due to selectivity and market timing skill during period of economic recovery only. We admit that these results contradict the rational expectations model. However under uncertainty framework, this effect disappears on behalf of rational expectation model and the efficient market hypothesis. This disappearance may be a result of increased number of high frequency trading witnessed recently that have made rarer market inefficiencies which is the main source of hedge fund performance.

14:40 - 15:25 **EXCHANGE RATES A** Room Yarmouth
Chairperson: Jiahan Li, University of Notre Dame

CRUCIAL EXCHANGE RATE PARITY. EVIDENCE FOR MEXICO
Eduardo Loría, UNAM, School of Economics

Through a structural vector error correction model, one restricted cointegrating relationship for monthly data (2002.01-2010.04) was found between three exchange parities of great relevance for the Mexican economy: US Dollar-Euro, Mexican Peso-US Dollar, and Mexican Peso-Euro. The data's structure revealed endogeneity of the last one, but the first is the one that adjusts the long run (cointegrating) relation. It was found a unitary elasticity of MxP-Euro parity to the other two parities, which validates PPP condition in absolute terms. These results are crucial to analyze the possible long-run exchange effects on the Mexican real and financial variables because of the possible intensification of the Euro crisis and the currency war.

EXCHANGE RATE PREDICTABILITY AT SHORT HORIZONS: EVIDENCE FROM ROBUST RISK FACTOR SELECTION
Jiahan Li, University of Notre Dame
Co-Author(s): Wei Wang, Pennsylvania State University

Exchange rate forecasting is believed to be difficult especially at short horizons. In this paper, we provide evidence of the out-of-sample predictability of exchange rates returns, where all risk factors appearing in the prevailing empirical models are included and robust model selection techniques are employed. Our comprehensive model nests existing economic fundamental models that explain exchange rate returns, and allows the model selection procedure to be carried out adaptively and efficiently. To overcome the degree-of-freedom problem and multicollinearity problem introduced by a large number of explanatory variables, we employ a state-of-the-art estimation procedure in high-dimensional statistical inference, namely penalized least squares. We find that, by selecting important risk factors as well as their interactions, the out-of-sample predictability of a FX model is increased for all currency pairs at different forecasting horizons. The

significance of short-horizon predictability is confirmed by both statistical criteria based on mean-squared-errors, and economic criteria based on dynamic portfolio management.

14:40 - 15:25 **FLOW FIELD FORECASTING** Room Salon H
Chairperson: Michael Frey, Bucknell University

TO SMOOTH OR NOT TO SMOOTH: HOW AND WHEN TO UPDATE THE SPLINE SMOOTHING PARAMETER IN THE CONTEXT OF FLOW FIELD FORECASTING
Kyle Caudle, South Dakota School of Mines and Technology
Co-Author(s): Michael Frey, Bucknell University

Flow field forecasting is a new statistical procedure for time series forecasting that is based on the premise that if the time series is currently following a dynamic similar to one observed in its past record, then the process is likely to advance forward in a manner that is similar to how it behaved in the past. Flow field forecasting has three steps: a penalized spline regression (PSR), a Gaussian process regression (GPR) built upon the PSR, and a forecasting mechanism that uses the GPR to interpolate future process changes step-by-step. Often data presents as a flow requiring the need to continuously, efficiently and autonomously update forecasts. The GPR and forecasting steps of flow field forecasting readily meet this demand. Updating the PSR in a strict sense involves a complete reevaluation of its global smoothing parameter by analyzing all data, not just recent data. We show how, by maintaining a small cache of auxiliary statistics, this reevaluation is possible and how to adjust the smoothing if warranted. This procedure allows flow field forecasts to be conveniently updated. Proof of concept will be demonstrated using several different data sets that show varying degrees of non-stationarity.

FLOW FIELD FORECASTING WITH SELF-TUNING AND HETEROSCEDASTICITY
Michael Frey, Bucknell University
Co-Author(s): Kyle Caudle, South Dakota School of Mines and Technology and Yajie Liu, Bucknell University

Flow field (FF) forecasting is a recently introduced statistical methodology for time series forecasting. Its basic premise is that, if a statistical process's present dynamic is similar to that seen in its past record, then it will in the future probably do something similar to what it was observed next to do in the past. This premise is often enough applicable and sufficiently flexible to be a useful basis for forecasting. Accordingly, FF forecasting has three stages: 1) a representation of the process's different past dynamics and the changes that followed therefrom, 2) an interpolation of process changes from dynamics seen in the data record to dynamics not available in the record, and 3) a mechanism that exploits this interpolator. FF forecasting uses penalized spline regression for Stage 1, Gaussian process regression for the Stage 2 interpolator, and a stepwise procedure in Stage 3 to make the forecast. We make two contributions to FF forecasting's development. First, we show how to self-select the flow field characteristic length for the Stage 2 interpolator, giving a novel solution to a standard covariance modeling problem. Second, standard FF forecasting assumes the statistical process is homoscedastic. We show how to effectively allow for heteroscedasticity.

14:40 - 15:25 **FORECASTING WIND POWER** Room Tufts
Chairperson: Juan Fernando Rendon Sanchez, Cass Business School, London

FORECASTING HOURLY WIND POWER PRODUCTION DATA IN SWEDEN WITH TIME SERIES MODELS
Xiangli Meng, Dalarna University, Sweden

This paper focuses on forecasting hourly wind power production data in Sweden with time series approaches. The two main characteristics of hourly production data are high frequency and periodicity. The spectral analysis is used for analyzing the seasonal patterns in hourly production. The HEGY-type seasonal unit root test for hourly data is used to test for stationarity and the data reject the presence of unit roots at most of the seasonal frequencies. Four methods are employed to forecast the conditional mean of hourly production: Seasonal ARIMA model, ARAR algorithm, Holt-Winter seasonal algorithm and Periodic Autoregressive models. The forecasts are made on differents horizons for intra-day market and day-ahead market. Evaluating forecasts results with root mean square error and mean absolute error, the Periodic Autoregressive model have the best perfomace in most cases.

FORECASTING WIND POWER VIA CLUSTERING OF NEURAL NETWORKS
Juan Fernando Rendon Sanchez, Cass Business School, London
Co-Author(s): Lilian De Menezes,

This paper explores clustering in the weights space as an approach to model structural combination of neural networks to forecast wind power. Pools of networks are trained using the same data, generating multiple models that are summarized in centre networks, which are then used to produce one-step-ahead forecasts. Different configurations of models are tested and their performance reported. Results show marginal improvements compared to the sample average of the pool's forecasts and the persistence model (naive benchmark), but overall accuracy is similar for different configurations thus suggesting that clustering is relatively insensitive to initial settings. Finally some venues for improvements are highlighted and an agenda for future work established.

14:40 - 15:25 **LABOUR MARKET A** Room Simmons
Chairperson: Norbert Schanne, Institute for Employment Research (IAB)

INSTITUTIONAL BACKGROUND IN WAGE BARGAINING
Vasileios Bougioukos, Bangor University, UK
Co-Author(s): Shanti Chakravarty, Bangor University and Konstantinos Nikolopoulos, Bangor University

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.

ARE THEY RUNNING WITH THE PACK? THE FORMATION OF EXPERTS' EXPECTATIONS ON LOCAL LABOUR MARKETS
Norbert Schanne, Institute for Employment Research (IAB)

Expectations regarding the economic development might be correlated due to various reasons: because individuals use the same public information and similar evaluation methods, and because of social learning or herding amongst peers. We analyse to what extent expectations are driven by herd behaviour, and if it contributes to make expectations more realistic.

In a novel survey the CEOs of the local departments of the German Federal Employment Agency are asked for their short-term unemployment expectations. In this data we can discriminate between close and less-close peers to overcome the reflection problem and to quantitatively assess answers regarding the two questions.

We find strong evidence for herding in expectation formation. The social multiplier approximately doubles the effect of observable information included in the model. Compared to counterfactual expectations without herding constructed from the estimates, herding seems to improve the accuracy of the expectations.

14:40 - 15:25 **MULTIVARIATE METHODS** Room Hyannis

Chairperson: Johannes Tang Kristensen, CREATES and Aarhus University

CONSUMER PRICE LEVEL PREDICTIONS: A STATE SPACE APPROACH

Christian Heinze, Bielefeld University

Based on price level indices at the county level for the year 1993 and inflation figures at state and national level for subsequent years I predict regional consumer price levels in Germany for the years 1993-2005. Current interest in regional cost of living has been fueled by the agglomeration wage differential debate, e.g. Wheeler (2006), Yankow (2006), Blien et al. (2009). However, price level indices for German counties are currently not available for the years following 1993.
My predictions are derived from a state space model similar to Mardia et al. (1998), which allows to combine kriging (optimal prediction in space) and Kalman filtering and smoothing techniques (optimal prediction in time). The latter yield prediction standard errors which incorporate prediction uncertainty but ignore estimation uncertainty. The bootstrap of Pfeffermann and Tiller (2005) allows to account for the latter.
My state space model involves unknown variances, which may be zero. For this case Andrews (2000) was able to show that off-the-shelf parametric and non-parametric bootstrap procedures are inconsistent. Furthermore, any modification necessarily shows poor performance for small but nonzero variances. I quantify the problem by means of a Monte Carlo experiment reflecting the above setting.

DIFFUSION INDEXES WITH SPARSE LOADINGS

Johannes Tang Kristensen, CREATES and Aarhus University

The use of large dimensional factor models in forecasting has received much attention in the literature, with the consensus being that improvements on forecasts can be achieved. However, recent contributions in the literature have demonstrated that care needs to be taken when choosing which variables to include in the model. A number of different approaches to determining these variables have been put forth. These are, however, often based on ad-hoc procedures or abandon the underlying theoretical factor model.
In this paper we will take a different approach to the problem by using the LASSO as a variable selection method to choose between the possible variables and thus obtaining sparse loadings from which factors or diffusion indexes can be formed. This allows us to build a more parsimonious factor model which is better suited for forecasting compared to the traditional principal components (PC) approach. We provide an asymptotic analysis of the estimator and illustrate its merits empirically in a forecasting experiment based on US macroeconomic data. Overall we find that compared to PC we obtain improvements in forecasting accuracy using our estimator and thus find it to be an important alternative to PC.

14:40 - 15:25 **POLITICAL FORECASTING** Room New Hampshire
Chairperson: Li-Fei Huang, Ming Chuan University

FORECASTING THE 2012 US PRESIDENTIAL ELECTION
Leighton Vaughan Williams, Nottingham Business School

In this paper we attempt to identify the best method for forecasting the 2012 US Presidetial Election. We consider daily data of forecasts from the 2008 Election based on expert opinion, econometric models, opinion polls and prediction markets (Iowa Electronic Markets, Betfair and InTrade). Rather than assessing each forecast by the single realisation of a random variable that was the actual election outcome, we take instead an information centred approach asking which forecast contained the most information at any given time. We also assess the existence, extent and implications of biases in a large data set derived from a major political prediction market.

TIME SERIES RESEARCH OF THE SUPPORT RATES OF TWO MAJOR PARTIES IN TAIWAN
Li-Fei Huang, Ming Chuan University

Democracy in our country has a history of more than 30 years, and it has gradually become two major parties politics like the United States of America. The essence of democracy is just and fair elections, therefore, this research will confer the effect of important political affairs over the years to the support rates of two major parties. Using several economical indices as input variables, transfer function model in time series can be analyzed. A change in a policy, such as declaring martial law ended, is suitable to be analyzed in step intervention model. A sporadic event, such as shooting with a gun, is suitable to be analyzed in pulse intervention model. Time series analysis can also be used to forecast the future support rates of two major parties.

14:40 - 15:25 **UNCERTAINTY AND THE REAL-TIME BUSINESS CYCLE ANALYSIS 2** Room Maine
Chairperson: Gianluca Cubadda, University of Rome "Tor Vergata"
Organizer: Gian Luigi Mazzi, Eurostat

LEADING INDICATORS OF REAL ACTIVITY AND INFLATION FOR TURKEY, 2001-2010
Sumru Altug, Koc University and CEPR

This paper develops a set of leading indicators of industrial production growth and consumer price inflation for the period 2001-2010. The choice of indicators is based on pseudo out-of-sample forecasting exercise implemented by Stock and Watson (2003), amongst others. We find that asset prices that reflect expectational factors or interest rates that capture the costs of borrowing for the Turkish economy tend to have the greatest predictive power for future real activity and inflation. Our findings provide evidence on the factors determining real activity and inflation in a period of disinflation and normalization for the Turkish economy.

REGULARIZED CANONICAL CORRELATION ANALYSIS OF MULTIPLE TIME SERIES
Gianluca Cubadda, University of Rome "Tor Vergata"
Co-Author(s): Bernardini Emmanuela, Bank of Italy

This paper proposes a strategy to detect and impose reduced-rank restrictions in large multivariate time series models. In this framework, Cubadda and Hecq (2011) have recently shown that Canonical Correlation Analysis (CCA) does not perform well. Based on the notion of Regularized CCA (Vinod, 1976), we propose a new technique that combines CCA and multivariate partial least squares. In particular, we suggest to use proper shrinkage estimators of the variance-covariance matrices that are involved in CCA, thus obtaining a method that is asymptotically equivalent to CCA, but it is numerically more stable in finite samples. We document the merits of the new approach both by simulations and empirical applications.

15:50 - 16:35 **BANKING** Room Boston Univ
Chairperson: Mikhail Mamonov, Higher School of Economics, National Research University, Moscow

IMPLEMENTATION OF AN ANN MODEL FOR FORECASTING THE SOLVENCY OF 5 MAJOR GREEK BANKS
Christina Konstantinidou, NTUA
Co-Author(s): Serafeim Gravanis, undergraduate student

The dramatic condition in the Greek economy during the last years and the interaction of the economic situation with the banking sector lead to the need of bankruptcy prediction models in order to find the indicators that influence the bank's solvency. As the financial situation of the banking sector is an important prerequisite for the economy, in this research, we tried to develop an ANN model in order to forecast the behavior of five major Greek banks. As independent variables related to the bank profitability we considered treasury bonds, interbank deposits and total deposits, as well as the macroeconomic parameters, gross national product, gross domestic product, wholesale price index, consumer price index, net external debt, euro exchange rate and net international reserves. The dependent variables were the ratios of profits to asset, equity to asset and non-performing loans to total loans. The forecasts derived from the proposed model were compared with those of standard time series methods (Naive, SES, Holt etc) as well as regression models. The results indicate that neural networks provide more accurate forecasts for banking failure.

ASSESSING BANK RUNS USING TOBIT ESTIMATION TECHNIQUE: A CROSS-COUNTRY EVIDENCE AND FORECAST
Mikhail Mamonov, Higher School of Economics, National Research University, Moscow

In this paper we build an instrumental tool for assessing and forecasting both the probability and the size of bank runs (deposit withdrawals) using tobit model. Bank runs lead to liquidity shocks in banking institutions causing negative effect on banking sector stability (e.g. through inter-bank market channel). The later usually results in a slow-down of lending activities of banks and may consequently impede economic growth. There is a large amount of literature that focuses on

modeling either the dynamics of deposits in banks (Maechler, McDill, 2006) or the probability of deposits withdrawals (De Graeve, Karas, 2010). This literature doesn"t distinguish between the determinants of deposit dynamics during the periods of banking crisis compared to the other periods. We fill in this gap. Based on sample of 22 developed and developing economies during the 1986-2009 we define factors of bank runs which play the crucial role within the periods of banking crisis. Our key result is that purely macroeconomic factors (such as unemployment) contribute less to the probability of bank runs (only about one third) than determinants coming from either balance of payments (currency exchange rate, share of net export of goods and services in GDP) or banks" reputation (proxied by non-performing loan ratio). Using our tobit-model we provide scenario forecasts for both the probability and the size of bank runs in a country-level basis for 2012-2014.

15:50 - 16:35 **BOOSTING AND BAGGING** Room Hyannis

Chairperson: Devon Barrow, Lancaster University

FORECASTING ASIAN MARKET RETURNS: BAGGING OR COMBINING?

Mark Wohar, University of Nebraska at Omaha
Co-Author(s): Steven J Jordan, Econometric Solutions and Andrew Vivian, Loughborough University

Using a wide range of predictors, we provide evidence on the out-of-sample forecasting of stock returns for a broad set of Asian countries for which there is little prior evidence. We find several macro and technical predictors can (statistically) improve forecast accuracy and (economically) generate gains to investors. Simple forecast combinations consistently yield substantial benefits both in terms of forecast accuracy and utility gain. We are the amongst the first to apply the bagging method to market return predictability. From a statistical perspective, we find bagging does not consistently improve forecast accuracy contrary to US findings in other contexts. However, from an economic gains perspective, bagging consistently provides large gains. The magnitude of the forecasting gains for our Asian countries is generally larger than those found for the US and other G7 countries. This suggests that market characteristics, e.g., size and liquidity, may affect the economic value that can be derived from forecasts. Using extended predictor variables and several combining methods, our Asian evidence provides clear evidence that predictability exists outside the US and other large markets.

HOW TO BOOST FOR TIME SERIES? AN EMPIRICAL EVALUATION OF FORECASTING ACCURACY FOR META-PARAMETER CHOICES IN BOOSTING

Devon Barrow, Lancaster University
Co-Author(s): Sven F. Crone, Lancaster University Management School

Despite the prominence of model combination research in forecasting, Boosting has received only limited attention. Of only 12 papers on boosting for time series, all focus on (marginal) extensions by altering one or more meta-parameters, e.g. the combination method or the loss function , effectively creating a set of distinct boosting algorithms. As their relative empirical accuracy has been largely ignored, the contribution of each extension, and possible interactions, remains unclear.

To address this gap and provide guidance on how determine meta-parameters for Boosting, we decompose the boosting algorithm into its basic components. The resulting framework shows six meta-parameters which control all boosting variants: (1) loss function and (2) loss function type determine the contribution of each base-learner in the combination, (3) stopping criteria and the (4) loss update method control the ensemble size, as well as (5) combination method, and (6) the base learner. We derive all possible realisations of each meta-parameter from literature, and combine all to create a full-factorial design of 96 theoretically feasible meta-parameter choice combinations in Boosting. The experimental design allows a large scale empirical evaluation of the accuracy of (A) all existing boosting algorithms, as each established variant such as AdaBoost.R2 or AdaBoost.RT is contained as one of the 96 possible combinations, (B) all theoretically feasible "novel" boosting variants not yet published, (C) a "best" combination of all meta-parameter choices, as well as (D) general recommendations on the relative importance of each meta-parameter factor on model accuracy. Accuracy is assessed across 111 time series of the NN3 competition, assessing errors across multiple time origins and a fixed forecast horizon using reliable metrics of sMAPE and MAE. Accuracy is compared to a set of statistical benchmark methods including models selection, bagging and model averaging. A multifactorial analysis of variance (MANOVA) provides empirical evidence that different meta-parameter choices have a (statistically) significant impact on forecast accuracy, with certain parameter choices proving superior to standard boosting approaches adopted in classification and regression.

15:50 - 16:35 **CLIMATE FORECASTING** Room Tufts

Chairperson: Fernando Luiz Cyrino Oliveira, Pontifical Catholic University of Rio de Janeiro

CLIMATE CHANGE AND ATLANTIC STORM ACTIVITY

Winston Moore, University of the West Indies, Cave Hill Campus
Co-Author(s): Wayne Elliott, University of the West Indies, Cave Hill Campus and Shernell Thompson, University of the West Indies, Cave Hill Campus

Due to the potential for economic damages, capital losses and mortality, forecasting the likely frequency and intensity of North Atlantic hurricanes is high on the agenda of both Caribbean and North American stakeholders. Previous research in the area suggests that Sea Surface Temperature plays a critical role in the formation of hurricanes and thus their intensity but not in their numbers. Nevertheless, there is still some scepticism among climate researchers regarding the climate change-hurricane activity nexus. This study therefore attempts to use econometric modelling techniques to address this on-going debate in the area. The results reported in the study suggest that models that account for climate change provide forecasts that were statistically closer to the actually hurricane outcome during the out-of-sample forecast evaluation period (1980-2010).

MODELING CLIMATE PHENOMENA IN HYDROLOGICAL TIME SERIES USING A STOCHASTIC HYBRID MODEL

Fernando Luiz Cyrino Oliveira, Pontifical Catholic University of Rio de Janeiro
Co-Author(s): Reinaldo Castro Souza, Pontifical Catholic University of Rio de Janeiro

Considering the predominance of hydraulic energy generation in Brazil, the strong dependence of the hydrological regimes makes evident the uncertainty of this problem. This suggests the stochastic modeling of the affluences, aiming at the optimization of the performance of system's operations. Currently, to the modeling and simulation of the affluences, it is used a Periodic Autoregressive Model, PAR(p). That said, this study aims at estimating a hybrid model that integrates the advantages of PAR(p) in modeling the seasonal effects of the hydrological series, and adds the exogenous variable SOI, that is relevant in the modeling of the incorporation of the climate phenomena El Niño and El Niña. The proposed here includes, in an exogenous way, both the influence of the phenomena mentioned, through the estimation of a linear regression among the residues of the "traditional" models, and the SOI index series, incorporating this regression's coefficient in the traditional modeling. The results showed that the SOI index impact was statistically significant, showing a high irregular and cyclic component, probably as a result of long term impacting phenomena. It seems that the use of the model proposed in this study to the subsystem mentioned has obtained a significant reduction in the "MAPE".

15:50 - 16:35 **DEMAND FORECASTING** Room Wellesley

Chairperson: Katharina Amann, Georg-August-University of Goettingen

EFFICACY OF POS DATA FOR ORDER FORECAST PERFORMANCE: AN EMPIRICAL STUDY

Okada Daijiro, Economic and Statistical Consultant
Co-Author(s): William Sichel, Revlon, Inc

A retailer's demand forecast may contribute to distortion of demand signal which in turn increases the volatility of the retailer's orders, thereby making (short term) order forecast difficult and potentially leading to undesirable levels of inventory and at times a bullwhip effect. Through information sharing within a supply chain, POS data have become increasingly available to suppliers. POS data are generated by consumer purchases that are causally (and statistically) independent processes from the activities in upper stream of the supply chain. While some have argued, on theoretical and case-study basis, that this very property of POS should be beneficial to improving the order forecast performance, empirical investigation on this issue has been scarce but growing. Following Williams and Waller (J.Bus.Logistics, 2010, 2011) we investigate efficacy of POS data for the order forecast. We use weekly POS, inventory, and order history data of cosmetic products covering 30 months period containing a few dozen SKUs. We examine time series properties of individual and aggregate series and conduct order forecasting competition with or without POS data. We assess how much and how often POS data contribute to order forecast performance, and attempt to identify factors that make POS a useful instrument.

AN APPROACH OF FORECASTING CUSTOMER DEMAND WITH THE DISCRETE KALMAN FILTER FOR THE CALCULATION OF LOT SIZES

Katharina Amann, Georg-August-University of Goettingen
Co-Author(s): Jutta Geldermann, Georg-August-University of Goettingen

Today Production Planning is an important assignment in industrial companies. In fact, many companies use simple approaches with several restrictions to plan their production. The presentation introduces an advanced approach in operative production planning: It includes the Kalman filter as an estimator of customer demand in the calculation of the production outputs. To start with, a forecasting competition between the Kalman filter and well-know forecasting methods like exponential smoothing is performed. Therefore, out-of-sample tests based an application-oriented data sets are used. Within the competition, the forecasting accuracy is evaluated by forecast-error measures. Based on these results, the possible impact of forecasting methods on stock levels as well as service levels is analyzed. For example, in a heijunka-levelled system the production output of the next period is defined as the difference between the current inventory and the defined upper limit of inventory. By implementing the Kalman filter to generate next period's demand forecast, this additional information could be included in the operative production planning. If the predicted demand is less than or equal to the output necessary to refill the stock, next period's production output could be reduced or free capacities could be used for different products for instance.

15:50 - 16:35 **EXCHANGE RATES B** Room Yarmouth

Chairperson: Paola Sánchez, Fundación Universitaria Luis Amigó

FORECASTING COMMODITY CURRENCIES WITH DYNAMIC BAYESIAN MODEL AVERAGING METHODS

Daniel Buncic, University of St. Gallen
Co-Author(s): Gian-Marco Frey, University of St. Gallen

We use recently developed Dynamic Bayesian Model Averaging (BMA) and Bayesian Model Selection (BMS) methods to forecast a number of commodity currencies using a set of around 25 standard macroeconomic as well as financial variables that include the VIX and also various commodity price indexes. We find that the selected dynamic BMA and dynamic BMS specifications perform very well when evaluated out-of-sample not only when compared to common simple benchmarks such as random walk, exponential smoothing and low order autoregressive models, but also when compared to static BMA and BMS models and also various forms of simple time varying parameter autoregressive models.
Our study finds further that allowing for fast changes in the time variation of the model size, ie., the number of predictor variables that are included in a given time period, as well as in the magnitude of the coefficients is an important feature of exchange rate data that substantially improves the out-of-sample forecast performance of the dynamic BMS and BMA models, where the speed of change in the model size and coefficients is specified by the magnitude of the so called forgetting factor. These results are robust to various loss functions that are used to evaluate the forecasts as well as to the priors used in the prediction variance.

MODELING OF COLOMBIAN EXCHANGE RATE USING RECURRENT NEURAL NETWORKS ARMA-NN
Paola Sánchez, Fundación Universitaria Luis Amigó
Co-Author(s): Fernán Villa, Universidad Nacional de Colombia

Modeling and prediction of time series has been in last times a lot of attention, due to the necessity to have with accurate tools to make a right decision and to surpass theoretical, conceptual and practical limitations that each series can display with the traditional approaches. In this sense, the neural networks have demonstrated to be a valuable tool, because they allow to represent nonlinear relationships, which are not well captured by other models. The investigations around the neural networks have led to the development of different topologies, which adapt better to diverse problems. It is as well as, it seems to be that by the prediction problem, neural networks with some type of recurrence display better approaches than other models, because, they conserve an long memory of the series behaviors. This paper proposes using of autoregressive moving average recurrent neural networks ARMA-NN in the modeling and prediction of the Colombian exchange rate, evaluating its performance by the contrast with an ARIMA model and a traditional neural network. The results are in favor to use of ARMA-NN networks, every time that the prediction display a better approach to the values of the series, which stimulates the use of such models in similar series and the research of other topologies of recurrence that allows better results.

15:50 - 16:35 **LABOUR MARKET B** Room Simmons
Chairperson: Alain Kabundi, University of Johannesburg

FORECASTING REGIONAL LEVELS OF EMPLOYMENT BY OCCUPATION
Oliver Jones, Bielefeld University, Germany
Co-Author(s): Harry Haupt, Bielefeld University

We forecast regional labour demand in Germany on an aggregation level that brings us to roughly 180 regions and 50 to 350 occupations. The database consists of the social security information of the workforce employed on the 31st of June each year from 1984 to 2008. A highly automatic procedure is needed since it is impossible to manually generate more than 9000 forecasts. We start with univariate time series methods, like exponential smoothing, since they have proven to be successful in mass forecasts. Then panel data methods are evaluated against them. The occupational classification that is currently used when the social security information is recorded is regrouped. The aim is to achieve better forecasts through more homogeneity within the occupations regarding the educational level. Furthermore the resulting time series should be more stable because we combine occupations for which we observe a high interchange of workforce. Because of data privacy protection only aggregated results are shown.

USING LARGE DATA SETS TO FORECAST SECTORAL EMPLOYMENT
Alain Kabundi, University of Johannesburg

We implement several Bayesian and classical models to forecast employment for eight sectors of the US economy. In addition to standard vector-

autoregressive and Bayesian vector autoregressive models, we also include the information content of 143 additional monthly series in some models. Several approaches exist for incorporating information from a large number of series. We consider two approaches – extracting common factors (principle components) in a factor-augmented vector autoregressive or vector error-correction, Bayesian factor-augmented vector autoregressive or vector error-correction models, or Bayesian shrinkage in a large-scale Bayesian vector autoregressive models. Using the period of January 1972 to December 1989 as the in-sample period and January 1990 to March 2009 as the out-of-sample horizon, we compare the forecast performance of the alternative models. Finally, we forecast out-of sample from April 2009 through March 2010, using the best forecasting model for each employment series. We find that factor augmented models, especially error-correction versions, generally prove the best in out-of-sample forecast performance, implying that in addition to macroeconomic variables, incorporating long-run relationships along with short-run dynamics play an important role in forecasting employment.

15:50 - 16:35 **SEASONALITY** Room New Hampshire

Chairperson: Aris Syntetos, University of Salford

A COMPARISON OF AUTOMATED ARIMA MODEL SELECTION METHODS TO BENEFIT SEASONAL ADJUSTMENT USING X12-ARIMA

Alex Stuckey, Australian Bureau of Statistics
Co-Author(s): Jonathan Campbell, Australian Bureau of Statistics

Forecasting can play an important role in filter-based techniques of seasonal adjustment by reducing reliance on asymmetric filters at the end of the series. This has been shown in many cases to reduce future revisions to seasonally adjusted estimates. Manual selection of appropriate models can be very costly as analysts must periodically re-assess these models for a large number of time series. Therefore, automatic procedures of model selection are highly desirable. In this paper we present an empirical study to evaluate methods of selecting seasonal ARIMA models for the specific purpose of aiding seasonal adjustment. Our aim is to identify which model selection methods favour models that are most effective in minimising revisions to seasonally adjusted and trend estimates, as produced with the X12-ARIMA seasonal adjustment procedure. In so doing, we compare several existing, popular methods of seasonal ARIMA model selection, as well as two additional approaches to be introduced here. The alternative procedures are evaluated via a simulation study and also compared using a number of real world data sets.

GROUPING SEASONALITY AND THE FORMATION OF GROUPS

Aris Syntetos, University of Salford
Co-Author(s): John Boylan, Buckinghamshire New University and Mona Mohammadipour, Buckinghamshire New University

Traditionally, seasonality is estimated from an item's own data history resulting in the determination of individual seasonal indices (ISI). However, when the data is noisy and the length of history is short, ISI may not provide accurate forecasts. A possible answer to this challenge is to use the knowledge of demand at some aggregate/group level to improve forecasts at the individual level. This approach is usually referred to as group seasonal indices (GSI) and an important assumption in its application is that a

grouping mechanism is available. Our work provides extensive empirical evidence on the comparatives merits of these approaches. The formation of seasonal groups is also explicitly addressed and liked to performance results.

15:50 - 16:35 **TIME SERIES ANALYSIS** Room Maine

Chairperson: Seppo Pitkänen, Lappeenranta University of Technology

BLIND SOURCE SEPARATION FOR NON-GAUSSIAN TIME SERIES USING HIGHER-ORDER STATISTICS

Ester Gonzalez-Prieto, MPIDR
Co-Author(s): Antonio Garcia-Ferrer, UAM and Daniel Peña, UC3M

A new blind source separation approach that exploits both the non-Gaussianity and the temporal structure of the dataset is introduced. We propose a fourth-order temporal blind identification (FOTBI) algorithm, which identifies the set of underlying independent components by the joint diagonalization of several time-delayed fourth-order cumulant matrices. Some Monte Carlo simulation experiments are carried out to investigate the performance of FOTBI. According to our results, FOTBI seems to be a good alternative for the separation of non-linear time series independent components.

RECOGNIZING CHAOTIC PHENOMENA

Seppo Pitkänen, Lappeenranta University of Technology

Chaotic developments cannot be forecast. However, it is hard to know beforehand, whether the phenomen at hand is chaotic or not.
It is known, that sensitive dependence on initial conditions is the typical feature of chaotic dynamical systems. It follows, that nearby trajectories become exponentially separated in finite time under the action of flow (or a map). This makes the evolution of those systems very complex and essentially unpredictable, except maybe in the short run.
The most important tool for diagnosing the presence of the initial sensitivity in a dynamical system is provided by Lyapunov characteristic exponents (LCEs). For a long time the LCEs were regarded as less or more theoretical indicators of the amount of chaos, but nowadays we have methods to estimate them from empirical data. This opens new opportunities to evaluate the long-term predictability of systems.

16:40 - 17:40 **FORECASTING: PAST AND FUTURE** Room Simmons
Chairperson: J Keith Ord, Georgetown University

FORECASTING: PAST AND PRESENT
Spyros Makridakis, INSEAD

Forecasting is a truly interdisciplinary field with statisticians, engineers, operation researchers, judgmental psychologists, economists and several disciplines in social science contributing to improve its accuracy and usefulness. Scientific-based forecasting has a long history, and it is the aim of this talk to assess its value, outline its successes and failures, discuss its advantages and limitations and propose ways to exploit the former while avoiding or minimizing the latter. Forecasts are indispensable for all types of future oriented decisions and any improvement in its accuracy or the way it is utilized provides significant practical benefits for enhancing the value of such decisions. The big challenge facing the field is, therefore, to maximize its usefulness and relevance by both evolutionary improvements, based on available knowledge and empirical evidence, but also by thinking out of the box and implementing significant changes that will move the field into new directions by integrating interdisciplinary knowledge and going beyond existing, restricted practices emphasizing historical data and point forecasts while ignoring feedback, uncertainty and risk as well as the role of judgment. The upward potentials for the field of forecasting are far-reaching if its members can satisfy, in an integrated, constructive manner, the real needs of decision and policy makers, creating a new future for the field and seeing the demand for its services exploding.

16:40 - 17:40 **ACHIEVING A LASTING FORECAST ACCURACY IMPROVEMENT IN NESTLE WATERS NORTH AMERICA** Room Wellesley
Chairperson: Ron Levkovitz, CTO. Ogentech Limited
Organizer: Ron Levkovitz, CTO. Ogentech Limited

CONTINUOUS OPTIMIZATION OF DEMAND PLANNING SYSTEMS
Ron Levkovitz, CTO. Ogentech Limited

Demand planning is in the core of supply chain management. Most large companies and many mid-size ones have built a demand planning practice based on one of the many supply chain planning suites available. These suites, however, are costly and many times fail to achieve their basic premise of improving forecasting and demand planning accuracy. As most demand planning systems are part of comprehensive supply planning suites the natural tendency is to supplement them by purchasing a dedicated forecasting solution. The hope is that this solution, replacing the forecasting provided by the supply chain planning suite, will improve the accuracy. While dedicated solutions may provide some improvements they are usually tied to the original system design and they rarely provide lasting meaningful improvements; not because the dedicated solution is inadequate but because the problem lies in the entire model and not in any individual forecast.
In this presentation we show that the problem of achieving a lasting improvement from DP systems is due to lack of flexible, adaptive modeling that guides the forecasting process and enables continuous adaptation of

algorithms to data needs. We describe a general framework to optimize, maintain and update demand planning models, regardless of the hosting system. We demonstrate that by using this approach it is possible to achieve a dramatic and lasting accuracy increase with modest investment.

CONTINUOUS OPTIMIZATION OF THE APO DP SYSTEM OF NESTLE WATERS NORTH AMERICA

Siddharth Reddy, Nestle Waters North America (NWNA)
Co-Author(s): Ron Levkovitz, CTO. Ogentech Limited and Jonathan Santos, Nestle Waters North America (NWNA)

Nestle waters North America is America's largest bottled water company supplying a range of local, national and premium brands like Pure Life, Perrier, Deer Park, and San Pelegrino. The company bases its supply chain operations on SAP APO©, a comprehensive SCM suite that also includes a demand planning module. NWNA started using APO some years ago and decided to improve the accuracy of the system by using the Ogentech continuous maintenance approach, endorsed by Nestle. In this presentation we describe the optimization efforts done to improve the forecast accuracy of the APO DP system of NWNA. We describe the analysis and how its results were implemented to create a framework for continuous improvement inside APO DP. We illustrate the challenges and the eventual success of the approach and present a detailed analysis of the outcomes of the optimization.

THE VITAL INGREDIENT OF DP CONTINUOUS OPTIMIZATION -- COMBINING PLANNERS AND SYSTEM

Jonathan Santos, Nestle Waters North America (NWNA)
Co-Author(s): Ron Levkovitz, Ogentech Limited and Siddharth Reddy, Nestle Waters North America (NWNA)

In Nestle Waters North America (NWNA), as in most manufacturing companies, demand planning is used as a decision support tool to help the demand planners, who have the last say. The forecast provided by the demand planning suite is often taken to ODP meetings where it is challenged by marketing and sales personnel and has to be defended. An important and necessary part of the optimization of the DP system in NWNA involved developing the trust of the demand planners in the statistical forecasting results. To achieve this, a feedback framework allowing the planners to understand the outcome of their changes was created. This included indicators presenting to the planners when intervention is required and where it is most beneficial. We shall present the results of this approach and show a special set of user tools which are part of the methodology and are designed to increase planners confidence in the automatic system and to guide them where and how to change the automatic results. By using the framework the planners can easily detect continuous problems and biases and correct them thus creating a positive and lasting planning cycle.

16:40 - 17:40 **BANK RISK** Room Boston Univ
Chairperson: Garfield Riley, Eastern Caribbean Central Bank

DOES BASEL II PILLAR 3 RISK EXPOSURE DATA HELP TO IDENTIFY RISKY BANKS?
Ralf Sabiwalsky, Freie Universitaet Berlin

Basel II Pillar 3 reports provide information about banks' exposure towards a number of risk factors, such as corporate credit risk and interest rate risk. Previous studies find that the quality of such information is likely to be weak. We analyze the marginal contribution of pillar 3 exposure data to the quality of equity volatility forecasts for individual banks. Our method uses (local in time) measures of risk factor risk using a multivariate stochastic volatility model for five risk factors, and uses measures of bank sensitivity with respect to these risk factors. We use two sets of sensitivity measures. One takes into account pillar 3 information, and the other one does not. Generally, we generate volatility forecasts as if no market prices of equity were available for the bank the forecast is made for. We do this for banks for which such data is, in fact, available so that we can conduct ex post - tests of the quality of volatility forecasts. We find that (1) pillar 3 information allows for a better-than-random ranking of banks according to their risk, but (2) pillar 3 exposure data does not help reduce volatility forecast error magnitude.

PREDICTING AGGREGATE CREDIT RISK OF THE BANKING SECTOR: DYNAMIC PANEL DATA ANALYSIS
Anna Pestova, Higher School of Economics, National Research University, Moscow

This paper provides an econometric analysis of aggregate credit risk in the banking sector using the panel data for 40 countries over the period 1997-2009. We built a forecast of aggregate credit risk in the Russian banking sector linked to macroeconomic conditions based on estimated equation for nonperforming loans ratio. Besides we conducted top-down stress-test exercise for Russian banks, including calculation of profitability and capitalization reduction in response to the exceptional, but possible macroeconomic shocks. Reliable forecast of aggregate credit risk is of great importance now as it can provide assessment of the scope of possible problem areas in the Russian banking system in case of «second wave» of global crisis and to predict how soon pre-crisis level of aggregate loan portfolio quality will be achieved. Using our credit risk model we forecast time required to reach the pre-crisis ratio of bad loans for Russia. In addition we calculated capital loss of banks in case of external shock scenario and possible bank request for government support.

FORECASTING NON-PERFORMING LOANS IN THE EASTERN CARIBBEAN REGION

Garfield Riley, Eastern Caribbean Central Bank
Co-Author(s): Kamilah Anderson, Economist, Eastern Caribbean Central Bank

Examinations of the credit risk structure of banks have taken on more prominence since the financial crisis of 2007-2009. The analysis of credit risk is important for risk officers in banks, as well as bank supervisors in regulatory institutions. Given the correlation between credit risk and subsequent banking system distress, the likely future evolution of credit risk factors will provide important information on potential difficulties ahead. This study provides detailed forecasts of credit risk – non-performing loans (NPLs) – for individual banks in the Eastern Caribbean Currency Union, and the aggregate banking system. Using a wide variety of methods, it is found that credit risk varies substantially between countries, and among foreign and indigenous banks.

16:40 - 17:40 **COMBINING FORECASTS B** Room Hyannis
Chairperson: Ed Blair, SAS Institute Inc

COMBINING TIME SERIES DISAGGREGATORS

Steven Vitullo, Marquette University
Co-Author(s): Ronald Brown, Department of Electrical and Computer Engineering, Marquette University and George Corliss, Marquette University

Disaggregation of time series is a mathematical inverse problem that breaks up aggregated (measured) time series data that is accumulated over an interval and estimates its underlying parts. Disaggregating time series data is frequently necessary when underlying series at the required frequency to produce accurate forecasts are unavailable. Current disaggregation research has considered a variety of methods but has not taken advantage of them in combination like studies in the forecasting domain. We present results from applying combining techniques in the disaggregation domain. In this study, we describe and test several common combining methods such as equal weighting, principal components, and trimmed mean, to combine many component disaggregation models for natural gas consumption. Using these combination methods, results are shown over a set of error metrics, and comparison is made with each individual component model. In addition to standard metrics for evaluation, we evaluate our accuracy on unusual events (days). Results demonstrate combining is at least as effective in the disaggregation and utility domain as in the forecasting domain, but combining disaggregation model estimates increases the accuracy of estimates on unusual events, the most important events.

SIMPLE ROBUST METHODS FOR AGGREGATING CONTINUOUS PROBABILITY FORECASTS: SOME EMPIRICAL EVIDENCE

Victor Richmond Jose, McDonough School of Business, Georgetown University
Co-Author(s): Yael Grushka-Cockayne, Darden School of Business, University of Virginia and Kenneth Lichtendahl, Darden School of Business, University of Virginia

The literature on aggregating point forecasts has consistently shown that the mean tends to perform well across various performance measures. Recently, it has also been shown that simple robust measures such as trimmed or Winsorized means can provide some improvements to the mean in certain situations. In this paper, we extend this analysis to the case of continuous probability distributions by providing two simple approaches for generating these robust alternatives. Using data from the US and European Surveys of Professional Forecasters, we illustrate and provide some empirical justification for these methods. In addition, we provide some possible explanations when these methods tend to perform better or worse than a simple average of forecasts.

COMBINED FORECASTS: WHAT TO DO WHEN ONE MODEL ISN'T GOOD ENOUGH.

Ed Blair, SAS Institute Inc
Co-Author(s): Bruce Elsheimer, SAS Institute, Inc. and Michael Leonard, SAS Institute Inc.

SAS High Performance Forecasting 4.1 offers a new, innovative process for automatically combining forecasts. Forecast combination, the subject of many academic papers in statistical and forecasting journals, is a known technique for improving forecast accuracy and reducing variability of the resulting forecasts. By integrating these ideas into a single software system, SAS High Performance Forecasting 4.1 surpasses the functionality of any existing software system that incorporates this capability. This paper describes this new capability and includes examples that demonstrate the use and benefits of this new forecast combination process.

16:40 - 17:40 **EVIDENCE-BASED IMPROVEMENTS TO CLIMATE FORECASTING: PROGRESS AND RECOMMENDATIONS** Room New Hampshire

Chairperson: J Scott Armstrong, Wharton School, University of Pennsylvania
Organizer: Kesten Green, University of South Australia

EVIDENCE-BASED IMPROVEMENTS TO CLIMATE FORECASTING: PROGRESS AND RECOMMENDATIONS
Kesten Green, University of South Australia
Co-Author(s): J Scott Armstrong, Wharton School, University of Pennsylvania and Willie Soon, Harvard Smithsonian Center for Astrophysics
Fildes and Kourentzes (IJF 2011) found that each of eight inexpensive extrapolation models provided forecasts of global mean temperature that were more accurate than those provided by the complex and expensive "General Circulation Models" used by the Intergovernmental Panel on Climate Change. We describe five methodological problems with their study: (1) Only short-term forecasts were tested; (2) Validation samples were small; (3) Validation data were known to be trending upwards; (4) Validation data were biased upwards; and (5) Forecast trends were not damped to allow for the complexity and uncertainty of the situation. These problems led to their forecasts being biased upwards and insufficiently conservative. We suggest how each of these problems could be addressed so as to improve upon the validity and policy-relevance of the research.
Discussants:
Robert Fildes, Lancaster University Centre for Forecasting,
Richard S Lindzen, MIT
Leonard Smith, London School of Economics

16:40 - 17:40 **FORECAST EVALUATION** Room Maine

Chairperson: Malte Knüppel, Deutsche Bundesbank

INTERVAL FORECAST COMPARISON
Maria Bagwell, Clemson University

Given two sources for interval forecasts of the same commodity for the same event, comparisons of their accuracy and precision can be informative to researchers. Accuracy, the closeness of computations or estimates to the exact or true value, has previously been evaluated comparing the midpoint of a forecast interval with the final value of the commodity event. We examine the accuracy of two interval forecasts by calculating the distance of the final value to the bounds of the forecast interval in addition to the midpoint. Using these metrics of comparison, accuracy is then measured by using the modified Diebold-Mariano test to determine if the errors from Iowa State University and USDA World Agricultural Supply and Demand Estimates (WASDE) interval forecasted hog prices differ. The results from the tests using the midpoints and the bounds of the intervals to calculate the error disagree. When measuring the error using the bounds of the interval the two forecasting sources do not significantly differ for one to four-step ahead forecasts, however by using the midpoint to calculate the error we find that two forecasting sources do significantly differ for one, three and four-step ahead forecasts.

EVALUATION OF MULTIVARIATE DURATION MODELS

Gloria Gonzalez-Rivera, University of California, Riverside
Co-Author(s): Yingying Sun, University of California, Riverside

The in-sample and out-of-sample evaluation of multivariate duration models is rather thin. On one hand, multivariate modeling becomes difficult because the asynchronous nature of durations across several assets and, on the other, evaluation of the multivariate predictive density requires distributional assumptions beyond multivariate normality. We approach the multivariate modeling by fixing the duration interval and recording the number of trades in each interval. The multivariate process is a vector of counts (discrete random variables) for which we specify the dynamics of the marginal distributions of each process and a copula that ties up the marginals to produce their multivariate distribution. We approach the evaluation of the multivariate model, i.e. dynamics, marginal densities, and copula, by applying the autocontour methodology (González-Rivera, et al., 2011) on i.i.d. U[0,1] probability integral transforms. Our testing is general enough to be applicable to univariate and multivariate density models with either continuous or discrete random variables, and it allows the researcher to focus on different areas of the conditional density model to assess those regions of interest. We construct hyper-cubes of different sizes within the maximum hyper-cube formed by a multidimensional uniform density [0,1]^n, and we assess the location of the empirical PITs (duplex, triplex,… n-plex of observations) within the corresponding population hyper-cubes. If the density model is correct, the volumes of the population hyper-cubes must be the same as those in their empirical counterparts. We propose several statistical tests with standard asymptotic distributions. We construct a trivariate model of trades for three major U.S. banks. Our tests reject the Gaussian copula because there is substantial asymmetry for long versus short durations. Instead, a Clayton copula seems to be preferred when durations are short and the number of transactions is large.

EVALUATING THE CALIBRATION OF MULTI-STEP-AHEAD DENSITY FORECASTS USING RAW MOMENTS

Malte Knüppel, Deutsche Bundesbank

The evaluation of multi-step-ahead density forecasts is complicated by the serial correlation of the corresponding probability integral transforms. In the literature, three testing approaches can be found which take this problem into account. However, these approaches can be computationally burdensome, ignore important information and therefore lack power, or suffer from size distortions even asymptotically. In this work, a fourth testing approach based on raw moments is proposed. It is easy to implement, uses standard critical values, can include all moments regarded as important, and has correct asymptotic size. It is found to have good size and power properties if it is based directly on the (standardized) probability integral transforms.

16:40 - 17:40 **Current Issues in Risk Estimation and Control and its implications for Portfolio Management** Room Tufts
Chairperson: John B Guerard, McKinley Capital Management, LLC

ADVANCES IN GLOBAL EQUITY RISK MODELING
Jose Menchero, MSCI

We present and discuss recent advances in global equity risk modeling techniques. In particular, we show that sampling error in the covariance matrix leads to systematic biases in the predicted volatilities of eigenfactor portfolios. We present a method for estimating these biases and adjusting the covariance matrix to remove these biases. We show that this technique is effective at mitigating the underestimation of risk of optimized portfolios. Another advance pertains to the estimation of factor volatilities. Cross-sectional observations provide an instantaneous measure of volatility across a collection of factors. We present a method for refining factor volatility forecasts based on cross-sectional observations, and show that it improves the accuracy of risk forecasts compared to a pure time-series approach.

PORTFOLIO MONITORING IN THEORY AND PRACTICE
Richard Michaud, New Frontier Advisors
Co-Author(s): David Esch, New Frontier Advisors and Robert Michaud, New Frontier Advisors

The when-to-trade decision is a critical yet neglected component of modern asset management. The need-to-trade decision in practice is typically based on suboptimal heuristic rules. The rebalancing decision is necessarily a statistical similarity test between the current drifted portfolio and a proposed new optimal. While statistical similarity tests are available in financial literature (Shanken 1985, Jobson and Korkie (1985) none treat the real world portfolio management problem that requires inequality constraints, targeted risk portfolios, trading costs, and asset manager style customization. The first practical similarity test for mean-variance optimality is the Michaud (1998, Ch. 7) rebalancing rule. However, the procedure ignored an often important consideration in that much of the information used to construct the current portfolio may be implicitly included in the new optimal. We develop new algorithms that address overlapping data in the Michaud test. We describe two procedures and give examples. The method allows large-scale automatable non-calendar based portfolio monitoring. The procedure is generalizable as a statistical similarity rule for quadratic programming contexts with potential applications well beyond portfolio management.

DO RISK MODELS EAT ALPHA? CUSTOMIZED RISK MODELS DO NOT! Robert Stubbs, Axioma

The fundamental tenet of quantitative portfolio construction is to balance the risk return tradeoff wherein an alpha factor model is assigned the task of predicting returns and a factor risk model is entrusted the duty to reign in risks. Naturally, the interaction between the alpha and risk factors plays an important role determining the composition of the resulting portfolios prompting the investment community to ask the question: Do risk models eat alpha? We delve into the mechanics of portfolio construction based on Markowitz MVO framework, and create an insightful narrative that concludes

with an unambiguous answer, namely, misaligned risk models eat alpha while custom risk models do not. We give theoretical and empirical results to corroborate our findings. As a byproduct of our research we demonstrate that taking a holistic view of the investment process and examining usage of risk models not only during portfolio construction but also during alpha forecasting can be beneficial.

METHODOLOGY FOR TESTING STOCK RETURN FORECAST MODELS FOR PERFORMANCE AND FACTOR ALIGNMENT/MISALIGNMENT
John B Guerard, McKinley Capital Management, LLC
Co-Author(s): Bernell Stone, BYU

Conventional alpha performance measurement assumes bilinear return-risk models. In addition to measurement error and pervasive multicollinearity, models using four or fewer systematic return factors are underspecified. Recent empirical tests indicate nonlinear, nonmonotonic dependencies. The standard bilinear models are underspecified/ misspecified.
Alpha performance measurement and factor alignment assessment need methodology that is robust to the usual measurement/multicollinearity problems and especially to an underspecified number of systematic return factors and nonlinear, nonmonotonic dependencies. This paper presents a response subsurface methodology that is robust to omitted factors, controls completely for multicollinearity, and mitigates variable and factor measurement/alignment errors. This methodology is distribution free and requires no a priori functional form assumptions. In contrast to bilinear models, this methodology handles well nonlinear, nonmonotonic dependencies.
We illustrate this framework by testing a widely used eight-variable return forecast model in Japan for 1980-2005 and five subperiods. We find significant alpha performance with the standard methodology. We apply a series of step-by-step power-optimizing response subsurface isolation transformations. Alpha performance improves while significantly increasing statistical efficiency (p-values < .0001).

16:40 - 17:40 **FORECASTING IN THE PRESENCE OF STRUCTURAL BREAKS** Room Yarmouth
Chairperson: Neil Ericsson, Federal Reserve Board
Organizer: Jennifer Castle, Oxford University

EVALUATING PREDICTIVE DENSITIES FOR U.S. OUTPUT GROWTH AND INFLATION IN A LARGE MACROECONOMIC DATA SET
Tatevik Sekhposyan, Bank of Canada
Co-Author(s): Barbara Rossi, Duke University and UPF

We evaluate conditional predictive densities for a large number of macroeconomic predictors for U.S. output growth and inflation. Our focus on predictive densities acknowledges the possibility that, although some predictors can improve or deteriorate point forecasts, they might have the opposite effect on higher moments. More specifically, we evaluate how well conditional predictive densities based on the commonly used normality assumption fit actual realizations out-of-sample. We find that the normality assumption is overall appropriate for both inflation and

output growth. The misspecification is mainly related to time-variation.

ADAPTIVE FORECASTING IN THE PRESENCE OF RECENT AND ONGOING STRUCTURAL CHANGE

Simon Price, Bank of England and City University, London
Co-Author(s): Liudas Giraitis, and George Kapetanios,

We consider time series forecasting in the presence of ongoing structural change where both the time series dependence and the nature of the structural change are unknown. Methods that downweight older data, such as rolling regressions, forecast averaging over different windows and exponentially weighted moving averages, known to be robust to historical structural change, are found to be also useful in the presence of ongoing structural change in the forecast period. A crucial issue is how to select the degree of downweighting, usually defined by an arbitrary tuning parameter. We make this choice data dependent by minimizing forecast mean square error, and provide a detailed theoretical analysis of our proposal. Monte Carlo results illustrate the methods. We examine their performance on 191 UK and US macro series. Forecasts using data-based tuning of the data discount rate are shown to perform well.

DETECTING PARAMETER NONCONSTANCY, JUMPS, AND CHANGES IN REGIME

Neil Ericsson, Federal Reserve Board

Automated model selection and impulse indicator saturation are two key tools in a coherent framework for generating, analyzing, and justifying empirical macro-econometric evidence. In particular, impulse indicator saturation includes the forecasting technique "intercept correction" as a special case, and its ability to detect parameter nonconstancy and changes in regime is relevant both in-sample and out-of-sample, so these two tools offer improvements to existing forecasting methodology. This paper illustrates and generalizes these tools by re-analyzing the empirical model of seasonally unadjusted UK narrow money demand in Ericsson, Hendry, and Tran (1994). Both tools demonstrate the robustness of that model to a wide range of feasible alternatives. These tools also yield statistical and economic improvements to that model, and so provide insights into the practical justification of empirical evidence in macro-economics. Combined, these tools permit computer-automated parsimonious detection of parameter nonconstancy and changes in regime.

TUESDAY JUNE 26 2012

08:30 - 09:30 **KEYNOTE SESSION 2** Room Salon G
Chairperson: Eric Stellwagen, Business Forecast Systems, Inc.

SUCCEEDING IN UNCERTAIN MARKETS
Phil Dolci, Jarden Branded Consumables Group

Business leaders today have an ever-increasing amount of data at their fingertips. But when it comes to forecasting, this data and the models they feed only provide an illusion of precision and control. Demand fluctuations are inherently unpredictable so the key to success is not to try to predict the variability, but rather to employ a strong process that manages through the variability. The most effective process is Executive S&OP, but it must be embraced across the entire organization for maximum impact. Moreover, some of the best practices in S&OP are counterintuitive such as operating with less detail. The benefits of a successful implementation are real (increased operating profit, reduced working capital, and increased service levels) and worth the investment.

09:40 - 10:25 **SALES AND OPERATIONS PLANNING 1** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

S&OP IMPLEMENTATION - DOING IT RIGHT
Amy Mansfield, V&M Star

The benefit of using Executive Sales & Operations Planning in organizations has been well documented, however, too often implementation of the process is done haphazardly and the results are not what were expected. The main pitfalls of a poor implementation are:
1. Not utilizing a champion to drive the process;
2. Underestimating the 'change-management' impact;
3. Bad data and assumptions; and
4. Not undertaking a formal implementation plan.
Successful implementation of Executive S&OP is possible with the right approach and strategy. Learn how to 'Do It Right' so you don't have to do it again.

09:40 - 10:25 **BUSINESS CYCLES** Room Massachusetts
Chairperson: Yasuyuki Komaki, Nihon University

BAYESIAN CLUSTERING APPROACH TO LARGE PANEL DATASET FOR EXTRACTING THE INFORMATION ABOUT TURNING POINTS IN BUSINESS CYCLE
Seung Hyun Kim, KAIST Business school
Co-Author(s): Duk Bin Jun, KAIST Business school
Detecting and predicting Business cycle turning points are the major concern of economic agents. So, central banks and many researchers have tried to develop the methodologies and the proxy variables for estimating and forecasting business cycle turning points. But most of them are driven by

only the small fractions of available large panel dataset including economic, real, and financial variables. In this study, Bayesian clustering framework is used to extract the information about business cycle turning points from large panel dataset. Based on the general model specifications of the clusters which are leading to or coincident with business cycle, the cluster membership probabilities of each series in large panel dataset and the state probabilities of business cycle phase are driven by Bayesian Markov Chain Monte Carlo estimation. And they are used to predict the next turning points. And a comparison across data vintages are carried out for checking the robustness of the clustering and evaluating on which series are more informative to detect and predict turning points time-invariantly.

RE-ESTIMATION OF BUSINESS CYCLE REFERENCE DATE USING REAL-TIME AND REVISED DATA

Yasuyuki Komaki, NIHON UNIVERSITY

Using real time data, we examine how the business cycle reference dates set after 1970's in Japan. We find Japanese reference dates since 1980 were determined by the method of "Date then Aggregate" faithfully. But the 8th cycle period (from March 1975 to Oct 1977) and the 9th cycle period (from Oct 1977 to Feb 1983) were not deiced by different methods. Especially we cannot recognize the 8th cycle period using real time GDP and business survey "TANKAN".On the other hand, we find different business cycle reference dates which are already set, when we estimate using revised data. In this study, we examine the most suitable time that we determine the business cycle reference dates, and which is important using real time base reference date or using revised base.

09:40 - 10:25 **GOLD PRICES** Room Boston Univ

Chairperson: Angi Rösch, FOM University of Applied Sciences, Munich

GOLD PRICING MODEL DURING THE FINANCIAL CRISIS

Sihai Fang, School of Economics & Management, University of Electronic Science & Technology of China, Chengdu, China
Co-Author(s): lu tao, .School of Engineering, Hong Kong University of Science and Technology, HK SAR China, 999077 and fan wei, School of Economics and Management, University of Electronic Science and Technology of China,

As a special commodity, gold possesses multiple features: as commodity, currency and hedging instrument. Its currency and hedging features are well manifested during this financial crisis since 2007. However, the hedging feature of gold was hardly discussed before. We can evaluate the above three features and decompose gold's value into three parts: the commodity value, the currency value and the risk premium value. In this paper we use the CRB index, the USDX index and the U.S. Treasury CDS spread as variables in our VAR model, finding that the USDX index is negatively correlated with the gold price, while the CRB index and the U.S. Treasury CDS spreads are positively correlated with the gold price. In particular, we find that the one-lagged CRB index, one-lagged USDX index, and two-lagged U.S. Treasury CDS spreads have significant impact on the gold price. Another finding is that the volatility of gold price has properties of clustering and long memory, but no asymmetry.

IMPACT OF FESTIVALS ON GOLD PRICE EXPECTATION AND VOLATILITY
Angi Rösch, FOM University of Applied Sciences, Munich
Co-Author(s): Harald Schmidbauer, Istanbul Bilgi University

Despite its growing prominence as investment during recent years, gold as jewellery still accounts for about half of global gold consumption, the world's largest consumers being China and India. There are annual festivals, such as Akshaya Tritiya Festival and the end of Ramadan, which can be considered as a source of demand in gold markets because they are linked to traditions of buying or making gifts of gold. More recently, traditional gifts of cash given during the Chinese Spring Festival have often been replaced with gold.
The purpose of our study is to investigate the effects of a selection of festivals on the expectation and volatility of daily gold price changes. Dummy variables indicating the day (or beginning) of the festival are modified to reflect a certain impact pattern within the surrounding time period; a combination of regression and GARCH models can then differentiate between pre- and post-effects of the (first) festival day. For example, we find that gold prices tend to increase significantly before Akshaya Tritiya, without a discernable increase in volatility. Before the end of Ramadan, on the other hand, an increase in volatility in gold price can be observed, with prices tending to increase shortly after.

09:40 - 10:25 **INFLATION** Room Tufts
Chairperson: Hector Zarate, Banco de la Republica-Universidad Nacional de Colombia

SYSTEMATIC INFLATION FORECAST ERRORS, FORECAST COMBINATION, AND THE FORECAST COMBINATION PUZZLE
Christopher Gibbs, University of Oregon

This paper proposes a new dynamic forecast procedure for combining forecasts of inflation. The procedure is based on the explanation of why the forecast combination puzzle exists and some stylized facts from the empirical inflation forecasting literature. The forecast combination puzzle is the empirical observation that equal weights or a simple average of point forecasts is typically the best forecasting procedure, beating the individual included forecasts and more sophisticated weighting schemes. The forecast combination puzzle is believed to exist because of misspecification error and structural breaks. The empirical literature on forecasting inflation has frequently proposed parsimonious forecasting models that exhibit these types of errors. The new combination procedure constructs weights by identifying these types of errors in forecast of inflation. The approach is shown to robustly beat an equal weights forecast for inflation using real-time economic data.

FORECASTING ANNUAL INFLATION WITH POWER TRANSFORMATIONS: THE CASE OF INFLATION TARGETING COUNTRIES.
Hector Zarate, Banco de la Republica-Universidad Nacional de Colombia
Co-Author(s): Angelica Rengifo, Banco de la Republica

To date, a total of 28 countries have committed to an inflation target as the anchor of their monetary policy in order to achieve price stability. For this

reason, forecasting inflation has become crucial for policy makers to decide on how to conduct the economic policy. From the statistics point of view, the leading approach to forecast short run inflation rely on the traditional Box and Jenkins time series building methodology, which fit seasonal autoregressive integrated moving average models to the first differences of logarithms of the underlying price index. Even though this common practice of applying the logarithm transformation of the Consumer Price Index enjoys advantages related to interpretation issues, the inflation forecasts are not necessarily optimal if this transformation does not stabilize properly the variance. In this paper, we analyze whether or not the incorporation of power transformations into the identification stage of the ARIMA models generate improved inflation forecasts. Specifically, we conduct an experiment taking into account four possible transformation strategies for the optimal parameter of the Box-Cox family and we compare the forecast precision through the mean squared error for different horizons.
Keywords: Box-Cox, rolling forecast comparison, seasonal ARIMA models.

09:40 - 10:25 **JUDGMENTAL ADJUSTMENTS** Room New Hampshire
Chairperson: Robert Fildes, Lancaster University Centre for Forecasting

SIMULTANEOUS COMPARISON OF FACTORS AFFECTING JUDGMENTAL ADJUSTMENTS IN DEMAND FORECASTING WITHOUT DOMAIN KNOWLEDGE
Jorge Alvarado, Pontificia Universidad Javeriana
Co-Author(s): Catalina Velasquez, Pontificia Universidad Javeriana
Judgmental adjustments on demand forecasting without domain knowledge have been proved pervasive and harmful for accuracy. Several factors have been found to influence the willingness to make judgmental adjustments without domain knowledge, but these effects have been tested separately. Finding possible interactions and measuring relative size effects among these factors will allow a deeper comprehension of the phenomena that might help design of forecasting support systems in order discourage these harmful adjustments. An experiment based on a fractional factorial design with two levels was conducted on students to assess the simultaneous and relative effects and interactions of the following factors on judgmental demand forecasting without knowledge domain: volatility, system advice, motivation (through a prize), time restrictions, system structured advice and inconsistent rumours. Results showed that volatility and rumours had the higher effect size regarding average adjustment and average adjustment size. The followings interactions emerged: Subjects tended to increase their adjustments with high volatility only in the presence of rumours, but tend to be more cautious to make adjustments in high volatility when a prize is offered. They also tended to reduce their adjustments when advised to do it under time restrictions.

BUILDING PREDICTION MODELS BASED ON BOTH JUDGMENTAL AND STATISTICAL INFORMATION
Robert Fildes, Lancaster University Centre for Forecasting
Co-Author(s): Andrey Davydenko, Lancaster University Centre for Forecasting

A common situation in economic forecasting is when forecasts are provided by experts at some points of time, but estimates should be updated as new

observed data becomes available. The frequency of updating short-term or medium-term extrapolations needed for decision-making can be much higher than the frequency of obtaining new forecasts from experts. At the same time, well-known statistical forecasting techniques cannot ensure the desired forecasting performance since they are based only on historical data and do not take into account important information known to experts.
The proposed approach is designed to incorporate prior judgmental information into a statistical prediction model and thereby to obtain forecasts using both expert knowledge and the latest available statistical data. The approach is based on constructing an aggregated model where both kinds of data are described by means of corresponding regression equations. Expert forecasts are modelled as estimates of future time series values or their functions. With the use of Bayesian methodology together with Markov chain Monte Carlo (MCMC) algorithms for numeric integration it becomes possible to use most realistic and flexible specifications for a data generation process. The use of the approach is demonstrated in application to different real world data examples. The analysis carried out suggests the possibility of improving the quality of forecasts as a result of the composite use of statistical data and expert information. In comparison with alternative Bayesian approaches based on providing subjective prior probability density functions on a model parameter space the above approach is more convenient and can be easier implemented in practical settings as it utilizes subjective information directly in a form of forecasts.

09:40 - 10:25 **MARKETING** Room Simmons

Chairperson: J Scott Armstrong, Wharton School, University of Pennsylvania

ON THE IDENTIFICATION OF FORECASTING MODELS IN THE PRESENCE OF PROMOTIONS

Juan Trapero, Universidad de Castilla-La Mancha
Co-Author(s): Robert Fildes, Lancaster University, Nikolaos Kourentzes, Lancaster University and Diego J Pedregal, Universidad de Castilla-La Mancha

Sales forecasting is of paramount importance to reduce inventory investment, enhance customer satisfaction and improve distribution operations. Shorter product life cycles, more competitive markets and more aggressive marketing, among other factors, have increased the complexity of sales forecasting. Forecasts are often produced using a Forecasting Support System that integrates a univariate statistical forecasting method with managerial judgment from expert forecasters. Managers may add information to the final forecast that is difficult to include in a statistical model, such as future product promotions; consequently improving the forecasting accuracy.

An alternative approach to the problem of promotional forecasting is to replace expert adjustments by multivariate statistical models that use past promotions information, resulting in causal models whose exogenous inputs are promotion features (price discounts, type of display, type of advertising, etc.). The present work investigates the adequacy of different multivariate models ranging from transfer functions to neural networks to cope with the problem of promotional sales forecasting. Furthermore, those models are compared to the results provided by experts through judgmental forecasting. The results shows that multivariate models developed on the basis of past

promotional information can outperform expert forecasts. We also consider hybrid models that use both statistical and judgemental adjustments. Weekly data from a manufacturing company is used to illustrate the results

TESTS ON THE PREDICTIVE VALUE OF EVIDENCE-BASED ADVERTISING PRINCIPLES
J Scott Armstrong, Wharton School, University of Pennsylvania

The primary use of evidence-based advertising principles is to create persuasive advertising. They can also be used to decide which ads would be most effective for a campaign. Most decisions regarding which ad to run are based on unaided judgmental forecasts of their effectiveness. We examined ways to improve upon unaided judgment. Raters were hired to complete a self-training module lasting less than two hours. Then they rated print ads against the advertising principles with the help of the Adprin Audit freeware at adprin.com. This procedure takes less than an hour per pair of ads. We used five raters per pair of ads
The ratings were combined across principles using the index method; this provides points for principles properly applied, deducts points for principles violated, and sums the points to yield an index score for each ad. The tests were conducted using matched pairs of print ads from Which Ad Pulled Best. Findings will be reported on 79 pairs of ads. The ads with the highest score in each pair were predicted to be more effective. These predictions were compared against those from unaided judgment.

09:40 - 10:25 **REALIZED VOLATILITY** Room Maine
Chairperson: Manabu Asai, Soka University

QUANTILE REGRESSION FOR LONG MEMORY TESTING: A CASE OF REALIZED VOLATILITY
Paulo Rodrigues, Banco de Portugal
Co-Author(s): Uwe Hassler, Goethe University Frankfurt and Antonio Rubia, University of Alicante

In this paper we derive a quantile regression approach to formally test for long memory in time series. We propose both individual and joint quantile tests which are useful to determine the order of integration along the different percentiles of the conditional distribution and, therefore, allow to address more robustly the overall hypothesis of fractional integration. The null distributions of these tests obey standard laws (e.g., standard normal) and are free of nuisance parameters. The finite sample validity of the approach is established through Monte Carlo simulations, showing, for instance, large power gains over several alternative procedures under non-Gaussian errors. An empirical application of the testing procedure on different measures of daily realized volatility is presented. Our analysis reveals several interesting features, but the main finding is that the suitability of a long-memory model with a constant order of integration around 0.4 cannot be rejected along the different percentiles of the distribution, which provides strong support to the existence of long memory in realized volatility from a completely new perspective.

EXTRACTING DYNAMIC CORRELATIONS FROM STOCK RETURN AND REALIZED VOLATILITY
Manabu Asai, Soka University

The paper considers the model of stock return and realized volatility using dynamic conditional correlations (DCC). The paper suggests the new specifications for the asymmetric effects on log-volatilities and dynamic correlations, combined with the heterogeneous market effects. The new DCC model can be estimated by the quasi-maximum likelihood method. The empirical analysis on Nikkei 225, Hang Seng and Straits Times indices shows the daily, weekly and monthly pattern of the asymmetric effects. The new DCC model also provides plausible one-step-ahead forecasts of the VaR thresholds for the period including the global financial crisis.

09:40 - 10:25 **STRUCTURAL BREAKS** Room Regis

Chairperson: Shin-Huei Wang, CORE , UCL and Beijing Normal University

BREAK DATE ESTIMATION FOR MODELS WITH DETERMINISTIC STRUCTURAL CHANGE

David Harvey, University of Nottingham
Co-Author(s): Stephen Leybourne, University of Nottingham

Correct specification of a break in the deterministic trend path of a series is well known to be critical for modelling, estimation and forecasting efforts. In this paper we consider estimating the timing of a break in level and/or trend when the order of integration and autocorrelation properties of the data are unknown. For stationary innovations, break point estimation is commonly performed by minimizing the sum of squared residuals across all candidate break points, using a regression of the levels of the series on the assumed deterministic components. For unit root processes, the obvious modification is to use a first differenced version of the regression, while a further alternative in a stationary autoregressive setting is to consider a GLS-type quasi-differenced regression. Given uncertainty over which of these approaches to adopt in practice, we develop a hybrid break fraction estimator that selects between the alternative estimators according to which achieves the global minimum sum of squared residuals. We establish the asymptotic and finite sample properties of the estimators considered, and find that the new hybrid estimator provides a reliable approach to break date estimation without requiring decisions to be made regarding the autocorrelation properties of the data.

FORECASTING LONG MEMORY PROCESSES SUBJECT TO STRUCTURAL BREAKS

Shin-Huei Wang, CORE , UCL and Beijing Normal University

We develop an easy-to-implement method for forecasting a stationary autoregressive fractionally integrated moving average (ARFIMA) process subject to structural breaks with unknown break dates.
We show that an ARFIMA process subject to two-types of breaks (the shift in mean and the persistent change in memory parameter) can be approximated well by an autoregressive (AR) model and suggest using Mallows' criterion to choose the order of the approximate AR model. Our method helps to avoid the confusion between long memory and structural changes and the issue of spurious breaks (e.g. Diebold and Inoune (2001) and Granger and Hyung (2004)).
Insights from our theoretical analysis are confirmed by Monte Carlo

experiments, through which we also find that our method provides a substantial improvement over
existing methods. Finally, an empirical application to the realized volatility of three exchange rates illustrates the usefulness of our forecasting procedure. The empirical success of the HAR-RV model is explained, from an econometric perspective, by our theoretical and simulation results.

09:40 - 10:25 **MACROECONOMICS** Room Hyannis
Chairperson: John Donovan, Economic Consultant

USING THE QUANTITY THEORY OF MONEY TO FORECAST ECONOMIC OUTPUT
James Forest, University of Massachusetts - Amherst

The quantity of money theory (QTM) has roots that trace back to early part of the twentieth century. The theory is often associated with the late University of Chicago economist Milton Friedman, who in 1976 was awarded the Nobel Prize in Economics. However, Yale economist Irving Fisher had built the framework nearly a half century prior. During the 20th century, the theory saw several periods of popularity and periods of disinterest.
The QTM in its simplest form can be expressed as: M*V=P*Q, where M is the supply of money in the economy, V is the velocity with which money spent and circulated through the economy, P is an indicator of the price level, and Q represents the quantity of goods. The right-hand side represents price multiplied by quantity – thus representing a measure of output. The left-hand side variables represent a mechanism by which the supply of money affects output based on its velocity.
Proponents argue, as long as velocity is "well behaved," economic output can be affected by controlling the money supply. We revisit the theory to evaluate its ability to forecast output. Alternative methods are compared to the QTM model and evaluated in both in-sample and out-of-sample. Results suggest this important model still suffers from inherent simplicity, yet shouldn't necessarily be ruled out as a monetary indicator.

EXPLORING THE POTENTIAL FOR SCIENTIFIC PREDICTION OF TRANSFORMATIONAL ECONOMIC DEVELOPMENTS
John Donovan, Economic Consultant

This paper focusses on identification of Transformational Economic Developments and whether they can be scientifically predicted. The hypothesis is that credible prediction of some Transformational Economic Developments is possible through rational, disciplined and repeatable means.
Transformational Economic developments constitute large scale changes in economic size and/or structure. They have significantly enhanced historical economic progress in Australia. Scientifically predicted Transformational Economic Developments can become highly valuable products. And research suggests that that the differential influences of future Transformational Economic Developments can be advantageously overlaid on long term forecasts of economic growth and change.
The feasibility of scientific prediction is being explored by identifying highly plausible Future Histories. Such narratives are constructed using past tense, and written by people as at a future time, showing how their future world came about. Significant progress has been made in developing methods to select possible predictions of Transformational Economic Developments, to write Future Histories necessary for each possible prediction, to establish degrees of confidence attaching to the Future Histories of each possible prediction and to eliminate Future Histories with

insufficient confidence for rating as a prediction. Research is ongoing in developing broadly based methodologies for scientific prediction.

10:50 - 11:35 **SALES AND OPERATIONS PLANNING 2** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

THE POWER OF ALIGNMENT AND ITS AFFECT ON THE OVERALL CULTURE
Brad McCollum, Jarden Branded Consumables

Executive S&OP has three primary objectives:
1. Balance Demand and Supply at the volume level
2. Fully integrate with financial planning
3. Connect the dials between corporate objectives on risk, strategy and policy, and the tactics required to support them.
Achieving these objectives delivers substantial financial return, but almost always requires significant cultural change. These cultural changes are what make the financial benefits possible. The culture change aligns organization human energy, which is the power behind the hard benefits. Learn how Executive S&OP brought about these cultural changes at Jarden Home Brands, and how those changes continue to support an environment of teamwork, honesty, and continuous improvement.

10:50 - 11:35 **BROADBAND FORECASTING A** Room New Hampshire
Chairperson: Qmars Safikhani, Quantum-Web
Organizer: Qmars Safikhani, Quantum-Web

SWEDEN WIRELESS BROADBAND TRAFFIC FORECAST 2012-2017
Qmars Safikhani, Quantum-Web

The Swedish wireless broadband market is booming due to the rapid development of LTE technology. The demand for wireless broadband services, which in terms of subscription has taken over both broadband and fixed line subscription, is intensive.
The demand for “broadband in your pocket” drives the supply; operators are increasingly concerned about managing the traffic congestion on the wireless network and are considering various solution to offload the wireless traffic over the fixed network as the bearer.
In this study, we analyse the potential wireless broadband traffic on the demand side. The demand is divided into two categories of residential and business customers.
The number of business wireless broadband subscribers by the end of 2011 stood at 1.058 million while the number of residential wireless subscribers was 3.809 million in the same period. According to my forecasts, the number of business and residential wireless broadband subscribers will increase by 118% and 116% respectively to 2.828 and 9.459 million by 2017. The average monthly data traffic of business subscribers is less than 1 GB while the same average for residential subscribers is nearly three times higher (2.74GB). The average monthly data traffic will increase by 109% and 102% for business and residential wireless broadband subscribers boosting the total Wireless broadband traffic to a staggering figure of 537 PB by 2017.

BROADBAND TRAFFIC FORECASTS AND THE IMPLICATIONS FOR DIFFERENT ACCESS TECHNOLOGIES
Lawrence Vanston, Technology Futures, Inc.

Because of latent growth and the rapid expansion of video over the Internet, peak demand for bandwidth on local access networks is increasing rapidly. We will present a long-term forecast for bandwidth demand and the network requirements to meet that demand. These requirements have tremendous implications for the viability and competitiveness of the various local access technologies such as DSL, FTTN, FTTH, HFC and wireless, either fixed or mobile. The details vary by market, geography and demographics, but the drive to upgraded fiber and wireless solutions may be faster than some operators would prefer. We will present our forecasts and analysis of the implications from a U.S. perspective, but the basic forces at play are universal.

10:50 - 11:35 **CRIME FORECASTING A** Room Maine
Chairperson: George Tita, University of California - Irvine
Organizer: George Tita, University of California - Irvine

SPATIAL-TEMPORAL MODELING FOR PREDICTIVE CRIMINOLOGY
Yoon Sik Cho, University of California - Irvine
Co-Author(s): Jeff Brantingham, UCLA, Aram Galstyan, University of Southern California and George Tita, University of California - Irvine
In this paper we develop a generative spatial-temporal model for describing inter-gang violence in Los Angeles. Specifically, we use LAPD data on gang related crimes that covers a period from 1999 to 2002 in the Hollenbeck neighborhood of Los Angeles. In this dataset, each data item describes an incident of attack and is characterized by a victim gang, the perpetrator gang, the time of the incident as well as the coordinates. Due to the data incompleteness, i.e., the unknown identity of the attacking gang, it is desirable to have models and corresponding inference methods that would allow recovering missing data in an efficient and accurate manner. Here we suggest a generative model and an efficient inference method based on variational Expectation-Maximization. We validate the model on synthetic as well as real-world data, and obtain very promising results on the identity-inference task. Furthermore, it is shown that combining both spatial and temporal information yields better accuracy than using either information separately.

THE LOS ANGELES PREDICTIVE POLICING EXPERIMENT
George Tita, University of California - Irvine
Co-Author(s): Jeff Brantingham, UCLA and George Mohler, Santa Clara University

It has long been know that crime is non-uniformly distributed in space and is highly dynamic in time. This talk will review the behavioral foundations of mathematical models of crime pattern formation developed at UCLA. Critical to these models are behavioral observations that criminal offenders search locally for their targets. Diffusion limitation, as understood mathematically,

therefore plays a key role in crime pattern formation. At a theoretical level, the models lead to unique predictions about how policing interventions may alter, displace or disrupt crime hotspots. A more fundamental question remains, however: Is it possible to accurately predict crime in space and time using such models? The presentation will review preliminary results of randomized controlled field experiments, conducted in collaboration with the Santa Cruz and Los Angeles Police Departments, which show that Predictive Policing mathematical models outperform the best-practices of police crime analysts in forecasting crime.

10:50 - 11:35 **DATA REVISIONS A** Room Massachusetts

Chairperson: Christian Mueller-Kademann, Zurich University of Applied Sciences

ARE GDP REVISIONS PREDICTABLE? EVIDENCE FOR SWITZERLAND

Boriss Siliverstovs, KOF ETH Zurich

This study presents a model that delivers more accurate forecasts of the revised rather initial estimates of the quarterly GDP growth rate in Switzerland during the period of the recent financial crisis. The key explanation to our findings is that our model, capitalizing on the information contained in the Business Tendency Surveys, is able to predict future revisions of the initial estimates. Our findings imply that there seems to be a scope for improvement of how preliminary estimates of the quarterly GDP growth rate are produced in Switzerland.

THE EFFECT OF REVISIONS ON THE RELATIVE PERFORMANCE OF LEADING INDICATORS AND POOLING TECHNIQUES - EVIDENCE FROM GERMANY

Katja Drechsel, Halle Institute for Economic Research
Co-Author(s): Scheufele Rolf, Swiss National Bank (SNB)

The revision of official statistics is a major issue in macroeconomic forecasting, because forecaster's performance can be only realistically judged on the information set available when the actual forecast is produced. Therefore data sets and forecasting models have to change over time. While for US-data, real-time analyses get more and more common in the academic literature, only few studies exist for Germany so far. However, the German Bundesbank has recently compiled such a database for a selection of national accounts data and business cycle indicators.
This paper therefore analyzes the real-time forecasting performance of leading indicator models for GDP and GDP components in Germany. Based on vintage data for all variables - the endogenous and the exogenous variables (leading indicators) - the individual performance of leading indicator models and their optimal combination are analyzed. In particular, we differentiate between potential indicators which undergo revisions (e.g. industrial production, retail sales, turnovers,…) and those which are not revised (e.g. survey, financial variables). Therefore we consider various weighting schemes to combine the information of leading indicators (e.g. optimized weights, Bayesian weights, weights based on past msfe). Our results indicate that weights for soft data are biased downward when using final release data.

10:50 - 11:35 **ELECTRICITY LOAD FORECASTING A** Room Regis
Chairperson: Lilian De Menezes, City University London

SHORT-TERM FORECASTING OF ANOMALOUS LOAD USING RULE-BASED TRIPLE SEASONAL METHODS: A CASE STUDY FOR GREAT BRITAIN
Siddharth Arora, University of Oxford
Co-Author(s): James Taylor, Said Business School, University of Oxford

We present a case study on short-term load forecasting using univariate methods, under both normal and anomalous conditions. Occurring on special days, such as public holidays, anomalous load conditions pose considerable modeling challenges due to their infrequent occurrence and significant deviation from load observed on normal working days. To overcome these limitations, we adopt a rule-based approach, which allows incorporation of prior expert knowledge of load profiles into the statistical modeling framework. We use triple seasonal exponential smoothing, triple seasonal autoregressive moving average (ARMA), and artificial neural networks (ANN), in conjunction with a rule-based approach for modelling anomalous load. We demonstrate that the errors from the rule-based models are about half the size of those for the corresponding original models that were not rule-based. Furthermore, we propose a novel discount weighted singular value decomposition (DW-SVD) based exponential smoothing method for normal working days. The proposed method utilizes similarity between different periods in the seasonal cycle, and enables more recent observations to be assigned greater weight in the dimension reduction through the use of discounting. Using nine years of half-hourly load for Great Britain, we evaluate point forecasts, for lead times from one half-hour up to a day ahead.

LOAD FORECASTING USING HOLT-WINTERS WITH MULTIPLE CYCLES AND EXOGENOUS VARIABLES
Lilian De Menezes, City University London
Co-Author(s): Mônica Barros, Escola Nacional de Ciências Estatísticas, Cristina Miranda, Pontifical Catholic University of Rio de Janeiro - PUC-Rio and Reinaldo Souza, Pontifical Catholic University of Rio de Janeiro

The aim of this paper is to develop an univariate model to forecast the hourly energy load in the city of Rio de Janeiro using exogenous climate variables and an updating scheme based on a multiple cycle Holt-Winters method with two seasonal patterns: hourly and daily.
The climate variables are incorporated in the model to improve forecasting performance when compared with the model without these components. The basic model is developed as a single error state space model, where parameter estimates are obtained by exponential smoothing methods with additive seasonality and multiple seasonal patterns. As an exogenous explanatory variable, we use the hourly temperature collected in different mesuring stations in the city of Rio de Janeiro.
The temperature effect over load in a tropical area, such as the one under study here, is different from that observed in other regions. The relationship tends to be direct, that is, higher temperatures (especially above a certain threshold) tend to raise load. The inverse effect (derived from low temperatures) is negligible is this area.

10:50 - 11:35 **ENVIRONMENTAL FORECASTING A** Room Boston Univ
Chairperson: Minfeng (Gary) Deng, Monash University

LEAKAGE FORECASTING BASED ON A MODIFIED FUZZY EVOLVING MULTIVARIATE METHOD.
Lech Birek, Coventry University
Co-Author(s): John Boylan, Buckinghamshire New University and Dobrila Petrovic, Coventry University

Fuzzy logic has been successfully used in different applications such as forecasting, decision support systems and artificial intelligence due to its ability to express vague statements and to handle uncertainty and non-linearity. The proposed approach, based on Takagi-Sugeno fuzzy system, uses a modified evolving clustering method to gradually group historical data into clusters. The clusters are then used to form the antecedent part of the fuzzy-if then rules. The parameters of the linear consequent part are calculated through the Recursive Least Squares method, and are updated as new data becomes available. The rule structure and consequent parameters are gradually evolving with clusters being removed or moved. The proposed approach is explored and investigated using real-life leakage data from one of the leading water supply companies in the UK. The leakage is forecasted 12 months ahead with the inputs consisting of previously recorded leakages, accompanied by the resource effort put into the leakage control and the Natural Rate of Rise in leakage which estimates the increase in the leakage within the water network without any active leakage policy. The results are compared with other fuzzy forecasting algorithms (such as Fuzzy C-means and Subclustering algorithm) as well as some standard statistical methods based on standard error measures.

FORECASTING HOTSPOT USING DIFFERENT SAMPLING DESIGNS: A COMPARATIVE STUDY OF EFFICIENCY
Sharad Gore, University of Pune,Pune-411007
Co-Author(s): Rajendra Gurao, University of Pune,Pune-411007

Hotspot detection is an important issue in environmental protection and conservation efforts. A hotspot is usually defined as a spot having the highest level of pollution, highest concentration of pollutant, highest number of occurrences of alarming incidences or something similar in nature. Statistically speaking, a hotspot is the sampling unit that returns the highest value for the variable of interest. The problem is non-trivial because hotspots are rarely visible and hence it takes careful and smart sampling effort to locate a hotspot. After locating or identifying a hotspot, the next challenge is to assess the seriousness of the hotspot. This generally requires predicting the value of the variable of interest at the hotspot if an observation is not made at the hotspot location and accurate measurement at the hotspot location if sample material is collected from the hotspot location. This paper attempts to compare different sampling designs that can help in hotspot detection without exhaustive testing of sample material over the domain of investigation. Simple random sampling, grid random sampling, grid systematic sampling and stratified random sampling are the classical sampling designs compared in this paper with ranked set sampling, the modern environmental cost-efficient sampling design. A case study is also presented to illustrate the results of the paper and also to demonstrate the difficulties in applying classical sampling designs, originally developed for estimating the population means, to non-classical situations where the requirement is to estimate the population maximum and also locate the sampling unit having the maximum value.

10:50 - 11:35 **FORECASTING IN FINANCE MARKETS B** Room Hyannis

Chairperson: Elena Ganon-Garayalde, Banco Central del Uruguay (BCU)

MODELING ROBUST FINANCIAL RETURN DYNAMICS: THE TIMING AND SOURCES OF FORECASTING PERFORMANCE AND LINKS TO REAL ECONOMY

Xiaochun Liu, Department of Economics, Emory University

We pretest the constancy of copulas for the U.S. financial returns as a preliminary diagnosis, which provides strong evidence in favor of dynamic tail dependence and varying in asymmetry over time. Shed light on these priori insights, this paper proposes a class of novel evolution equations within an intriguing decomposition framework: (i) to forecast out-of-sample financial returns; (ii) to constructively explore the timing and sources of forecasting performance via an econometric pin-down approach; (iii) and to economically link the forecasting performance to real economy.
This paper shows the empirical results that the proposed dynamic decomposition model not only outperforms benchmarks in terms of out-of-sample forecast, but suggests the robust strategy for a risk-averse investor in response to the market timing and the states of an economy. The econometric pin-down approach provides remarkable information to understand the reasons why a model performs better out-of-sample than its competing model. Importantly, the forecasts from the proposed dynamic decomposition models trace closely to NBER-dated business-cycle phases.

TIME SERIES MODELS FOR HIGH-FREQUENCY MONETARY VARIABLES: A CASE STUDY OF CURRENCY IN CIRCULATION IN URUGUAY

Elena Ganon-Garayalde, Banco Central del Uruguay (BCU)

The monitoring of high-frequency data is a very important issue in the daily review of monetary policy at the Central Bank in Uruguay. In this paper exploratory and functional data analysis followed by the build-up of univariate time series models (ARIMA) are used to capture the special characteristics of Currency in circulation –coins and currency money held by the public - business daily variable, and forecast the current month daily data. The Currency in circulation (CC) business daily data analyzed corresponds to the period between the years of 2005 to 2011.The forecast performance of the CC time series models is evaluated considering ad hoc and naive models achieving satisfactory results.

10:50 - 11:35 **LEADING INDICATORS** Room Tufts
Chairperson: Daniel Bachman, IHS

THOSE UNPREDICTABLE RECESSIONS...
Sergey Smirnov, Higher School of Economics (Moscow)

This paper examines real time trajectories of three well known leading indicators for the USA in conjunction with the contents of real time news-letters for these indicators. This made it possible to formulate the paradox: while leading indicators lead economy more at cyclical peaks (and not at troughs) it's more difficult for private experts to predict the beginning of a recession (not its end). And the situation is even more enigmatic as NBER always announces peaks with less lags than troughs. How could all these contradictions be resolved? Why is it so difficult for the private experts to recognize recessions in real time? What hampers their ability to recognize? The paper provides not only purely economical and statistical answers to these questions but also psychological ones. Forecasting of cyclical turning points as a decision making process is considered and some signs of a wishful bias in predicting recessions are revealed and discussed.

THE INFORMATION CONTENT OF THE ISM PURCHASING MANAGER SURVEY
Daniel Bachman, IHS

Many analysts assume that the U.S. ISM purchasing managers' survey provides important early information about economic activity but there are few formal tests showing how the ISM is related to actual economic data. I describe a series of tests to determine whether the ISM has information that can help predict future official economic data. Forecasts of the official data with the ISM included in the forecasting equation show at best marginal improvements over forecasts that do not use the ISM. The forecasting performance of the ISM appears to have deteriorated a bit since the 1960s and 1970s, but even in those decades its predictive power was not terribly strong. There is some evidence that some ISM surveys do forecast the direction of subsequent official data releases. The ISM does not, however, do a good job anticipating business cycle turning points. The ISM surveys may provide some modest additional information about U.S. economic conditions, but cannot replace the more comprehensive official measures.

10:50 - 11:35 **NEW APPROACHES FOR MODELING AND FORECASTING MACROECONOMIC FLUCTUATIONS A** Room Simmons

Chairperson: Gianluca Cubadda, University of Rome "Tor Vergata"
Organizer: Gianluca Cubadda, University of Rome "Tor Vergata"

INSTRUMENTAL VARIABLE AND VARIABLE ADDITION BASED INFERENCE IN PREDICTIVE REGRESSIONS
Joerg Breitung, University of Bonn
Co-Author(s): Matei Demetrescu, University of Bonn

Valid inference in predictive regressions depends in a crucial manner on the degree of persistence of the predictor variables. The paper studies test procedures that are robust in the sense that their asymptotic null distributions are exactly, not approximately, the same irrespective of whether the regressors are stationary or (nearly) integrated. Existing procedures often have power against sequences of local alternatives converging to the null at lower rates than the optimal 1/T rate in the case of near-integrated regressors. We first propose an extension of the variable addition method with improved asymptotic power, coming arbitrarily close to the optimal rate. Second, inference based on instrumental variables may further improve the (local) power of the test and even achieve local power under the optimal 1/T rate. We give primitive conditions under which the suggested variable addition and instrumental variable procedures are valid irrespective of the degree of persistence of the regressors or of endogenity.Moreover, all statistics proposed here are asymptotically standard normal (or chi-square) distributed. Monte Carlo experiments show that tests based on simple combinations of instruments perform most promising relative to existing tests.

MACROECONOMIC FORECASTING DURING THE GREAT RECESSION: THE RETURN OF NON-LINEARITY?
Laurent Ferrara, Banque de France
Co-Author(s): Massimiliano Marcellino, European University Institute and Matteo Mogliani, Banque de France

The debate on the forecasting ability of non-linear models has a long history, and the Great Recession provides us with an interesting opportunity for a re-assessment of the forecasting performance of several classes of non-linear models, widely used in applied macroeconomic research. We conduct an extensive analysis over a large quarterly database consisting of major real, nominal and financial variables for a large panel of OECD member countries. It turns out that, on average, non-linear models do not outperform standard linear specifications, even during the Great Recession period. However, in spite of this result, non-linear models enable to improve forecast accuracy in almost 40% of cases, and interesting patterns emerge across model types, variables and countries.

11:40 - 12:25 **SALES AND OPERATIONS PLANNING 3** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

GAINING NECESSARY & APPROPRIATE TOP MANAGEMENT BUY-IN
Indar Chaudhuri, Daiichi Sankyo

Executive S&OP sounds like a good idea. In fact, it often comes across as a no-brainer.
Who wouldn't want to balance demand and supply to ultimately drive financial results? However, getting the S&OP process off the ground is never easy. Balancing different viewpoints from different silos within a complex organization to achieve consensus based plans is a delicate task. The first step down this path is selling the idea of S&OP to Top Management. Follow one company's successful journey down this path: the hurdles they faced, the strategies they employed, and the difficult conversations they navigated to drive consensus and get the proverbial green light to move forward with what turned out to be a transformational project.

11:40 - 12:25 **BROADBAND FORECASTING B** Room New Hampshire
Chairperson: Qmars Safikhani, Quantum-Web
Organizer: Qmars Safikhani, Quantum-Web

PREDICTING SUBSCRIBER BASE FOR TECHNOLOGY COMPANIES
Vinay Kanetkar, University of Guelph

Many technology companies receive revenue depending upon subscriber base. Verizon, Netflix and other companies use monthly fees to attract customers. Thus, number of subscribers depends upon price charged. These companies, however, do not change their prices in short run, eight to 12 quarter. This paper investigates whether it is possible to forecast subscriber base in the short run as well as longer run. We use time series and econometric approach to build forecast. We use data for several companies (Verizon, Netflix and an entertainment service provider) to understand effectiveness of alternative methods.

FORECASTING THE FIBER PENETRATION AND COPPER ACCESS CHARGE
François Jeanjean, France télécom Orange

This paper aims to forecast the penetration of optical fiber network in European countries based on the level of copper access charge. In each country, there is an incumbent who owns the copper network and several entrants that pay an access charge to the incumbent to access consumers. There are also one or several cable operators. Incumbent or entrants can decide to invest or not in a fiber network. A decrease in copper access charge, tends to reduce retail copper prices and hence, the consumers' incentives to migrate toward fibre. This deters fiber investments. An increase in access charge has no major impact on incumbent, because the increasing consumers' incentives to migrate increases its expected fibre profits and compensates for the growth of its copper profits. By cons it encourages entrants to invest when

they have the capacity to do so.
The baseline scenario follows the current trend without changing the access charge.
The alternative scenarios, using an underlying competition model, take into account the impact of the change in the copper access charge on both migration path for customers and the incentives to invest.

11:40 - 12:25 **CRIME FORECASTING B** Room Maine

Chairperson/Organizer: George Tita, University of California - Irvine

DETECTING SPATIALLY LOCALIZED SUBSETS OF LEADING INDICATORS FOR EVENT PREDICTION

Daniel Neill, Assistant Professor of Information Systems
Co-Author(s): Seth Flaxman, Carnegie Mellon University

We propose a new method for detecting spatially varying subsets of leading indicators, which can then be used for event prediction. Given multivariate spatiotemporal data with a response variable of interest and multiple data streams which are potentially useful for predicting the response, we frame the problem as a joint optimization over all subsets of predictors, all proximity-constrained subsets of locations, and a range of time lags. Our approach combines feature selection and spatial subset search: we identify an optimal subset of leading indicators (LI) and locations maximizing the correlation between the LI time series aggregated over the locations and the response variable time series aggregated over the same locations. Even for small numbers of variables and locations, considering all possible subsets is computationally infeasible. Thus we describe a novel method for efficiently approximating the optimal solution, based on the linear-time subset scanning framework, and compare its results to ground truth and competing methods. We also present exploratory results on a geocoded dataset consisting of all crimes and calls for service in the City of Chicago in the year 2011. This work was partially supported by NSF grants IIS-0916345, IIS-0911032, and IIS-0953330.

ASSESSING THE IMPACT OF CRIME HOT SPOT FORECASTING

Wilpen Gorr, Carnegie Mellon University
Co-Author(s): Yong Jei Lee, Carnegie Mellon University

About 50 percent of a city's crime occurs in only 5 percent or less of its area, in "crime hot spots," which are excellent targets for police interventions. While the literature has identified "chronic" crime hot spots, this paper introduces "temporary" crime hot spots. Empirical findings include that (1) chronic crime hot spots are decreasing as police become more sophisticated and city fathers redevelop crime infested areas; (2) temporary hot spots are increasing perhaps as displacement from chronic hot spots; and (3) temporary hot spots are too short in duration to benefit from early detection, instead they must be forecasted for crime reduction. Leading-indicator crime forecast models have improved to the point to support a crime hot spot enforcement program, including temporary hot spots. We estimate that such a program could reduce serious violent crime by 10 to 20 percent in cities given enforcement size effect rates provided in the literature.

11:40 - 12:25 **DATA REVISIONS B** Room Massachusetts
Chairperson: Christian Mueller-Kademann, Zurich University of Applied Sciences

ON THE CORRESPONDENCE BETWEEN DATA REVISION AND TREND-CYCLE DECOMPOSITION
Jing Tian, University of Tasmania
Co-Author(s): Mardi Dungey , University of Tasmania; University of Cambridge; CAMA, Jan Jacobs, University of Groningen, CAMA and CIRANO and Simon van Norden, HEC Montreal; CAMA; CIRANO and CIREQ

This paper shows the correspondence between the Jacobs-van Norden (2011) data revision model and trend-cycle decomposition. In both, restrictions on the covariance matrix are employed and disturbances of unobserved components are correlated. Moreover, depending on the correlation coefficient between the disturbances of the unobserved components, the smoothed truth/trend is more volatile than the observed series.

CATCHING A FLOATING TREASURE: A GENUINE EX-ANTE FORECASTING EXPERIMENT IN REAL TIME
Christian Mueller-Kademann, Zurich University of Applied Sciences
Co-Author(s): Eva Koeberl, ETH Zurich

Forecasting real economic activity poses a considerable challenge not only due to hard-to-predict events like the current financial crisis but also due to the fact that targeted variables often undergo significant revisions after their first publication. In this paper we report the results of a genuine ex-ante forecasting experiment in real time. It highlights the difficulties of hitting a moving target and shows that in a realistic setting linear models in combination with survey data perform as good as much more sophisticated approaches.

11:40 - 12:25 **ELECTRICITY LOAD FORECASTING B** Room Regis
Chairperson: Lilian De Menezes, City University London

GAM MODELS FOR ELECTRICITY LOAD FORECASTING
Yannig Goude, EDF

Generalized Additive Models have been investigated recently to forecasts electricity consumptions at EDF R&D. These models achieve an interesting trade-off between accuracy of forecasts and adaptation to different data sets thanks to their semi-parametric structures. We apply GAM models on different data sets corresponding to different practical applications at EDF and show how these models can be used for real forecasts at different horizon (from intra-day forecasts to one year ahead forecasts).

11:40 - 12:25 **ENVIRONMENTAL FORECASTING B** Room Boston Univ
Chairperson: Minfeng (Gary) Deng, Monash University

RAINFALL MODELLING AND INSURANCE PRICING WITH HYBRID DISTRIBUTION
Komkrit Ovararin, Imperial College London
Co-Author(s): Nigel Meade, Imperial College London

We propose a rainfall model for four weather stations in a monsoon area, Thailand. Many agribusinesses are encountering with unpredictable losses from climate change, especially droughts and floods. Our rainfall model is based on two-step approach. Firstly, the seasonal unconditional probability of rain-days is estimated using a trigonometric function. A hybrid distribution is created to model the daily rainfall level. This probability distribution consists of a seasonally adjusted Weibull distribution which captures moderate rainfall and an Extreme Value distribution which captures extreme heavy rainfall. The comparison of a seasonal-mean model and a non seasonal- mean model demonstrates the importance of the inclusion of seasonality in providing more realistic a representation of daily rainfall. Monte Carlo methods are used to simulate the daily data in order to compare our model performance with the actual data and to study the rainfall insurance premium. Monthly and 30-days High Rainfall (HR) and Low Rainfall (LR) insurance premiums are illustrated with constant and seasonal strike prices. We find that the premium fluctuates over the year and is also dependent on the locations.

A MULTIVARIATE STATE SPACE MODEL FOR SPATIAL MOVEMENT FORECASTING
Minfeng (Gary) Deng, Monash University
Co-Author(s): George Athanasopoulos, Monash University

In this paper, we develop a forecasting model for spatially moving objects. Specifically, we model spatial displacements along the North-South axis and the East-West axis jointly in a multivariate state space framework. We show that our model is parsimonious and easy to implement, requiring nothing more than temporal observations of latitudinal and longitudinal coordinates. We apply our model in forecasting: (1) movements of Hurricane Gilbert in 1988 at 6-hour intervals; (2) movements of oil birds in Venezuela at 15 minutes intervals; (3) movements of GPS-tracked homing pigeons at 1-minute intervals. We find that the forecasting performance of our model is significantly better than the spatial equivalent of a naive model. We argue that allowing for contemporaneous correlation of displacements along the North-South axis and the East-West axis can significantly improve forecasting accuracy. Our model can be easily extended to include additional exogenous explanatory variables, such as wind speed or air pressure in forecasting hurricane movements. It can also be extended to forecasting movements of a cluster of spatial objects, each having its own patterns in spatial displacement but also correlated across space.

11:40 - 12:25 **NEW APPROACHES FOR MODELING AND FORECASTING MACROECONOMIC FLUCTUATIONS B** Room Simmons

Chairperson/Organizer: Gianluca Cubadda, University of Rome "Tor Vergata"

"GOOGLE IT!" FORECASTING THE US UNEMPLOYMENT RATE WITH A GOOGLE JOB SEARCH INDEX

Juri Marcucci, Bank of Italy
Co-Author(s): Francesco D'Amuri, Bank of Italy

We suggest the use of an Internet job-search indicator (the Google Index, GI) as the best leading indicator to predict the US unemployment rate. We perform a deep out-of-sample forecasting comparison analyzing many models that adopt both our preferred leading indicator (GI), the more standard initial claims or combinations of both. We find that models augmented with the GI outperform the traditional ones in predicting the monthly unemployment rate, even in most state-level forecasts and in comparison with the Survey of Professional Forecasters.

11:40 - 12:25 **PANEL DATA** Room Tufts

Chairperson: Joachim Schnurbus, Bielefeld University

PREDICTION IN AN UNBALANCED NESTED ERROR COMPONENT PANEL DATA MODEL

Alain Pirotte, University of Paris II - ERMES
Co-Author(s): Badi H. Baltagi, Syracuse University, Department of Economics and Center for Policy Research

This paper derives the Best Linear Unbiased Predictor for an unbalanced nested error component panel data model. This predictor is useful in many econometric applications that are usually based on unbalanced panel data and have a nested (hierarchical) structure. Examples include predicting student performance in a class in a school, or house prices in a neighborhood in a county or a state. Using Monte Carlo simulations, we show that this predictor is better in root mean square error performance than the usual fixed or random effects predictors ignoring the nested structure of the data.

FORECASTING IN NONLINEAR PANEL DATA REGRESSION BY STEPWISE UPDATING OF PRODUCT KERNEL WEIGHTS

Joachim Schnurbus, Bielefeld University
Co-Author(s): Harry Haupt, Bielefeld University

Forecasting of Y_iT+p using a general class of nonlinear panel data models Y_i,t = g(X_it, Z_it) + U_it with error process {U_it} and unknown smooth regression function g(.), cross-section i=1,...,N and time dimension t=1,...,T, continuous and categorical predictor variables X_it and Z_it, where the former may contain exogenous and lagged endogenous variables and the latter typically contains deterministic trend and seasonal components t and s, respectively, is considered.
In the framework of multiple nonparametric mixed kernel regression, continuous and discrete predictor variables X and Z are weighted by product kernel functions W(h) based on simultaneously estimated bandwidths h. The

aim of the paper is to demonstrate how the initially estimated bandwidths vector h_T=(h_X, h_Z) ---or parts thereof--- can be updated for p-step predictions, avoiding the computationally burdensome simultaneous estimation of h for each new cross-section of observations T+p, p=1,2,.... The updated bandwidth vector h_T+p is derived from the changes in the structure of the smoothing (hat) matrix H, where \hat{Y}=HY, after a new observation of X and Z is available. Besides an extensive Monte Carlo study we present a forecasting exercise for a well-known scanner panel data set from consumer good marketing.

11:40 - 12:25 **TIME SERIES METHODS** Room Hyannis

Chairperson: Souhaib Ben Taieb, Machine Learning Group - Université Libre de Bruxelles

SEGMENTED SMOOTHING OF TIME SERIES

Eliud Silva, Universidad Anahuac
Co-Author(s): Víctor M. Guerrero, ITAM

We consider a problem where the analyst needs to estimate trends with different percentages of smoothness for segments (with different variances) of an observed time series. We deal first with the two-segment case in detail and then simply extend the results to the three-segment situation. This proposal combines the goodness of fit and smoothness of the non-parametric approach for the different segments; in fact this could be seen as an extension of the smoothing situation where the analyst does not consider any segmentation. In the present case, it is possible to choose a priori the size of each segment or else employ a non parametric statistic proposed here to do that. The procedure produces smooth trend estimates that do not show discontinuities between segments, as could be expected and their estimated variances are also provided. In order to make an appropriate selection of the smoothing constants involved we propose using some smoothness indexes and present their properties. Some illustrative empirical examples that employ demographic and economic data are presented.

MULTI-STEP RECTIFICATION OF RECURSIVE TIME SERIES FORECASTS

Souhaib Ben Taieb, Machine Learning Group - Université Libre de Bruxelles
Co-Author(s): Rob Hyndman, Department of Econometrics & Business Statistics, Monash University

We assume the goal of multi-step forecasting is to estimate the conditional mean of the time series, and forecasting strategies are evaluated by how well they approximate it for different forecast horizons.

The recursive strategy estimates a one-step model and iterates it several times to obtain multi-step forecasts while the direct strategy estimates a different model for each horizon.

We will present a new forecasting strategy that attempts to borrow from the strengths of the recursive and direct strategies.

The different forecasting strategies will be compared using linear and non-linear simulated time series as well as real world data from forecasting competitions.

13:35 - 14:35 **SALES AND OPERATIONS PLANNING 4** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

LEAN MANUFACTURING, S&OP, AND GIS: PROPER TOOLS FOR GLOBAL MANAGEMENT
Jeff Greer, KVH Industries

In 1994 when I joined KVH, their satellite communications division was focused on products for the leisure marine market – in North America, Europe, and Australia. They had one manufacturing plant in Middletown, Rhode Island. Then things changed –
1. To be more cost competitive they began outsourcing overseas, causing longer lead times
2. They launched a new product line for satellite communication terminals and a broadband service for commercial ships at sea around the world

Bottom line – the supply chain was extended on both ends of the business – selling and buying. To cope with this required the implementation of proper tools – first Lean Manufacturing, then S&OP, and now a supply chain modeling method using a Geographic Information System (GIS) used within their S&OP monthly process. I will track and explain these events that have kept KVH competitive in a fully global market – on both ends of their business.

13:35 - 14:35 **THE MEASUREMENT AND CHARACTERISTICS OF PROFESSIONAL FORECASTERS' UNCERTAINTY** Room Simmons
Chairperson: Roy Batchelor, Cass Business School, City University London

THE MEASUREMENT AND CHARACTERISTICS OF PROFESSIONAL FORECASTERS' UNCERTAINTY
Kenneth Wallis, University of Warwick

Macroeconomic risk and uncertainty is an abiding preoccupation of policy makers, analysts and researchers, who use a multitude of indirect measures and proxy variables. A more direct assessment is provided by measures of uncertainty obtained from surveys of professional forecasters, which are receiving increased attention. Most of the research to date uses the US Survey of Professional Forecasters, while there is some recent work on two further countries that have survey data on uncertainty, namely the United Kingdom, via the Bank of England Survey of External Forecasters, which is the subject of some of our previous work and the main focus of the present paper, and the euro area, via the European Central Bank Survey of Professional Forecasters. The raw data on uncertainty in all three surveys comprise the personal probabilities of individual members of a panel of forecasters that the value of the variable of interest (inflation, output growth, ...) in a specified future period will lie in each of a number of preassigned intervals. Respondents thus supply density forecasts in the form of histograms. In this paper we consider several statistical issues that arise in the construction and interpretation of measures of uncertainty from these data, and illustrate some interesting properties of the resulting measures at the individual level, in particular their dispersion and the persistence of individual relative uncertainty.

13:35 - 14:35 **ELECTRICITY PRICES A** Room Hyannis
Chairperson: Bernell Stone, BYU

REGULARIZED CASCADE CORRELATION NETWORKS FOR ELECTRICITY SPOT PRICE FORECASTING IN COLOMBIA
Fernán Alonso Villa Garzón, National University of Colombia
Co-Author(s): Paola Andrea Sánchez Sánchez, Luis Amigó University and Juan David Velásquez Henao, National University of Colombia

The forecasting of electricity prices in liberalized and deregulated markets, like Colombia, has been considered a difficult task as the spot price is influenced by complex factors like the weather conditions, the demand and supply vary continuously. The aim of this paper is to propose the use of regularized cascade correlation neural networks to forecast the monthly average Colombian electricity spot price. The cascade correlation neural netwoks was developed in 1991 by Scott Fahlman and Christian Lebiere. This neural network builds dynamically a multilayer structure and presents theorical advantages over the multilayer perceptrons. In practice, the cascade correlation has shown better than multilayer perceptrons to forecast time series. Although the cascade correlation can be better than traditional neural networks, they can suffer overfitting. In order to control this problem, in this paper some regularization strategies are proposed: weight decay, weight elimination, and ridge regression to forecasting the mean monthly prices of the dispatch contracts in the wholesale electricity market of Colombia. We compared the obtained forecasts with a multilayer perceptron and an ARIMA model. The results show that the regularized cascade correlation capture the intrinsic dynamics of the time series better than other traditional models, and it is able to give a more accurate forecast for a horizon of twelve months ahead.

A HYBRID NEURO-FUZZY SYSTEM AND NEURAL NETWORK APPROACH TO FORECAST THE ELECTRICITY SPOT PRICE IN BRAZIL
Monica Barros, Puc-Rio and M.Barros Consultoria Ltda
Co-Author(s): LUCIO DE MEDEIROS, Instituto de Tecnologia para o Desenvolvimento - LACTEC

Modeling and forecasting highly volatile time series is a complex task not suited for linear models. An example of such series is the electricity spot prices in Brazil. In this article we apply a hybrid neuro-fuzzy/neural network system to forecast the weekly spot in the Southeast region of Brazil up to six weeks in advance. The input variables used are lagged values of the Natural Inflow Energy (for the entire region and its two main basins) and of the spot prices themselves. The hybrid system starts by fitting a neural network to data; the result of this network is then saved and used as an additional input at an ANFIS type neuro-fuzzy structure. The forecasting performance of the proposed hybrid model is presented for different periods and the results discussed.

USING PV SOLAR LEARNING RATES TO FORECAST A SCHEDULE OF PV PANEL PRICES AND ASSOCIATED ELECTRICITY PRICES
Bernell Stone, BYU

Measuring and predicting a learning rate, the dependence of cost/price on volume, is a standard technology forecasting technique. This paper develops company-level learning rates for four leading panel producers to update the 20% historical learning rate. We establish that the rate is accelerating (>40%). We then model solar grid competitiveness as a function of solar insolence and develop schedules of fair-return solar electricity prices for wholesale solar farms.
We find an accelerating learning rate, near competitiveness in the US southwest at current prices, and national competitiveness in the next 4 to 5 years in contrast to the DOE Annual Energy Outlook, which asserts more than two decades until solar is grid competitive for wholesale electricity generation. Our results have significant implications for energy policy, for low-cost non-carbon electricity generation, for the evolution of new electricity generating capacity, and especially for future electricity prices. Contrary to the DOE forecast of electricity price increases to 2035, we show low-cost solar displacing other generation alternatives, especially coal, and ultimately a dramatic reduction in electricity prices.

13:35 - 14:35 **JUDGMENTAL FORECASTING** Room Regis
Chairperson/Organizer: Dilek Onkal, Bilkent University

IMPROVING FORECASTING ACCURACY BY COMBINING ECONOMETRIC AND JUDGMENTAL FORECASTS IN TOURISM: THE CASE OF HONG KONG
Haiyan Song, School of Hotel and Tourism Management,The Hong Kong Polytechnic University
Co-Author(s): Shanshan Lin, The Hong Kong Polytechnic University

This paper aims to examine the forecasting accuracy by integrating the econometric and judgmental forecasts based on the Hong Kong tourism demand data. The quarterly forecasts of tourist arrivals from six source markets (i.e., Mainland China, Taiwan, Japan, the USA, the UK, and Australia) in Hong Kong up to 2015 were generated using the auto-regressive distributed lag model (ADLM). The Delphi technique was applied to incorporate experts' domain knowledge into those econometric forecasts. Performance was evaluated according to the mean absolute percentage error (MAPE) and the root mean square percentage error (RMSPE). As anticipated, the statistical forecasts adjusted by experts with sufficient contextual information and expertise were more accurate than the original statistical forecasts. Amongst the six source markets, four of them recorded a MAPE of less than 10% while two of them even had a value of less than 5%. It is found that judgmentally adjusted forecasts were more accurate than the econometric forecasts. The results also suggest that the level of judgmental improvements varied across the source markets, that is, the forecasting accuracy of the ADLM was improved either for the first or second round of the group forecasts across all the six source markets.

AN EMPIRICAL STUDY ON COLLABORATIVE FORECASTING TO IMPROVE ITS PERFORMANCE IN THE UK FOOD SUPPLY CHAIN

Can Eksoz, Brunel University, Brunel Business School
Co-Author(s): Afshin Mansouri, Brunel University, Brunel Business School

The importance of Collaborative Forecasting (CF) on partners' demand tracking and forecasting activities has been demonstrated in various industries. However, there are ongoing impediments in the food supply chain that prevent long-term and accurate CF among manufacturers and retailers. This study presents preliminary results of an empirical study conducted in the UK Food Supply Chain to determine key factors having an impact on CF performance between manufacturers and retailers. Semi-structured interviews guided the study to reveal preliminary hypotheses on the experimental pattern of Synchronized Information-Forecast Collaboration (SIFC). In this direction, the study will test developed model and hypotheses via survey method to reveal concrete and sustainable contributions assisting food practitioners to improve CF performance through the development of long-term and accurate CF.

HOW DO SCENARIOS HELP INDIVIDUAL AND GROUP-BASED JUDGMENTAL FORECASTS

Dilek Onkal, BILKENT UNIVERSITY
Co-Author(s): M.Sinan Gonul, Middle East Technical University and K.Zeynep Sayim, Bilkent University

Scenarios may serve as important tools for communication and information sharing between providers and users of forecasts in organizations. Current study attempts to examine the effects of providing scenarios as forecast advice on individual and group-based judgmental predictions. In an experimental study, participants are given time-series plots showing past demand for mobile phones accompanied by model-based point forecasts. They are then asked to generate their predictions in various formats (point, best-case/worst-case forecasts and surprise index) first as individuals and later as part of two-person teams (dyads). In the individual forecasting stage, there are four groups with respect to presence of scenarios where the participants may receive: i) no scenarios, ii) best-case scenarios, iii) worst-case scenarios, iv) both best-case and worst-case scenarios. For the group forecasting stage: a) dyads may receive no scenarios, b) each member of the dyad may receive a different scenario (one best-case and the other worst-case), c) both members of the dyad may receive both scenarios. Findings from individual vs consensus forecasts are discussed and implications for future research are given.

13:35 - 14:35 **RECENT ADVANCES IN FORECASTING WITH MANY PREDICTORS** Room Tufts

Chairperson/Organizer: Dobrislav Dobrev, Federal Reserve Board

THE THREE-PASS REGRESSION FILTER: A NEW APPROACH TO FORECASTING USING MANY PREDICTORS

Seth Pruitt, Federal Reserve Board
Co-Author(s): Bryan Kelly, Chicago Booth School of Business

We forecast a single time series using many predictor variables with a new estimator called the three-pass regression filter (3PRF). It is calculated in closed form and conveniently represented as a set of ordinary least squares regressions. 3PRF forecasts converge to the infeasible best forecast when both the time dimension and cross section dimension become large. This requires only specifying the number of relevant factors driving the forecast target, regardless of the total number of common (and potentially irrelevant) factors driving the cross section of predictors. We derive inferential theory in the form of limiting distributions for estimated relevant factors, predictive coefficients and forecasts, and provide consistent standard error estimators. We explore two empirical applications that exemplify the many predictor problem: Forecasting macroeconomic aggregates with a large panel of economic indices, and forecasting stock market aggregates with many individual assets' price-dividend ratios. These, combined with a range of Monte Carlo experiments, demonstrate the 3PRF's forecasting power.

ROBUST AND SPARSE FACTOR MODELLING

Christophe Croux, KULeuven
Co-Author(s): Peter Exterkate, CREATES Aarhus University

Factor construction methods are widely used to summarize a large panel of variables by means of a relatively small number of representative factors. We propose a novel factor construction procedure that enjoys the properties of robustness to outliers and of sparsity; that is, having relatively few nonzero factor loadings. Compared to the traditional factor construction method, we find that this procedure leads to a favorable forecasting performance in the presence of outliers and to better interpretable factors. We investigate the performance of the method in a Monte Carlo experiment and in an empirical application to a large data set from macroeconomics.

ROBUST FORECASTING BY REGULARIZATION

Dobrislav Dobrev, Federal Reserve Board
Co-Author(s): Ernst Schaumburg, Federal Reserve Bank of New York

The prediction of multivariate outcomes in a linear regression setting with a large number of potential regressors is a common problem in macroeconomic and financial forecasting models. We exploit that the frequently encountered problem of nearly collinear regressors can be addressed using standard shrinkage type estimation. Moreover, independently of near collinearity issues, when the outcomes are correlated random variables, univariate forecasting is often sub-optimal and can be improved upon by shrinkage based on a canonical correlation analysis. In this paper, we consider a family

of models for multivariate prediction that employ both types of shrinkage. The approach is designed to jointly forecast a vector of variables of interest based on a common (potentially very large) set of predictors. We illustrate its promising performance in applications to several standard forecasting problems in macroeconomics and finance relative to existing approaches. In particular, we show that it is possible to almost double the predictability of 1-month bond excess returns by using a set of predictors combining yield slopes and the maturity related cycles of Cieslak and Povala (2011). In addition, our theory offers a formal justification for why the Stock and Watson (2011) choice of five principal components is often the most suitable one when forecasting large sets of macro variables.

13:35 - 14:35 **SUPPLY CHAIN FORECASTING** Room New Hampshire
Chairperson: Matt Weller, Lancaster University

A FORECASTING STRATEGY FOR SUPPLY CHAINS WHERE CONSUMER DEMAND INFORMATION IS NOT SHARED
John Boylan, Buckinghamshire New University
Co-Author(s): Mohammad Ali, Buckinghamshire New University and Aris Syntetos, University of Salford

Downstream Demand Inference (DDI) is defined as an approach where the upstream member can mathematically infer the demand information from orders received from the downstream member and thus does not require a formal information sharing mechanism. Ali and Boylan have recently evaluated the assumptions for DDI in terms of three forecasting methods: ARIMA, Single Exponential Smoothing (SES) and Simple Moving Averages (SMA). They show that although demand cannot be inferred in the case of ARIMA and SES, DDI is possible if the supply chain links use the SMA method. This property of SMA allows upstream members to infer the consumer demand without the need to formally share this information.
In this study, we present a critique of the literature on factors that inhibits information sharing in supply chains. Based on this critique, we develop a conceptual framework which categorises the reasons why supply chains do not share information. We then move on to discuss the application of SMA for non-information sharing supply chains and quantify the benefits of the use of SMA using three performance metrics: forecast accuracy, inventory holding and inventory cost. Finally, we discuss how this initial agreement on the use of a certain forecasting methods may support increased collaborations between the partners.

OPTIMUM PARAMETERS FOR CROSTON INTERMITTENT DEMAND METHODS
Nikolaos Kourentzes, Lancaster University

Intermittent demand time series involve items that are requested infrequently, resulting in sporadic demand. That makes intermittent demand forecasting challenging and forecast errors can be costly in terms of unmet demand or obsolescent stock. In the literature such forecasting problems have been addressed using Croston's method and its variants, which have a single smoothing parameter alpha. Although the literature provides suggestions on the effective range of the parameter, it does not provide guidelines how to select it. This is crucial, particularly since growing evidence in the literature

points against the use of accuracy error metrics for model evaluation and hence parameter selection in intermittent demand time series. This leaves no valid methods how to best set the smoothing parameter of Croston's method. This study proposes a novel optimisation framework that is based directly on inventory metrics instead of accuracy measures. Models optimised this way are found to outperform Croston's models with fixed or conventionally optimised model parameters. Furthermore, this work finds that employing different parameters for smoothing the non-zero demand and the inter-demand intervals of Croston's, instead of a single parameter as the literature suggests, provides further performance improvements.

SUPPLY CHAIN FORECASTING BEST PRACTICES & BENCHMARKS: EMPIRICAL EVIDENCE FROM A SURVEY OF PRACTITIONERS

Matt Weller, Lancaster University
Co-Author(s): Sven F. Crone, Lancaster University Management School

Collaboration and information-sharing (CIS) partnerships in the supply chain, such as Vendor Managed Inventory (VMI) and Collaborative Planning, Forecasting and Replenishment (CPFR), have grown in recent times and are widely reported to deliver operational benefits. However, despite many simulation modelling and case-based studies in this area, the subject of forecasting under different CIS partnerships has been largely overlooked by researchers. More specifically, no studies have been dedicated to (a) how forecasts are conducted under different collaboration schemes in practice, nor (b) how forecasts should be conducted given different streams of quantifiable information. Given the importance of forecast accuracy on stock levels and therefore supply chain performance, and that forecasting forms an integral part of VMI and CPFR, this represents an important omission for both research and practice.

Following on from a pilot study in 2011, our research focuses on the first question in order to assess how companies are developing forecasts given their involvement in CIS partnerships. Through a comprehensive web-based survey of over 200 practitioners, we investigate forecasting-related activities across multiple dimensions, including: the types of information shared and how it is used, the specifics of the forecasting approach (use of judgement and statistical methods, aggregation level & periodicity), and the usage of software to support forecasting.
The results of the study provide novel insights into supply chain forecasting practice and identify information that may aid in improving forecasting accuracy. We find that forecasters are heavily reliant on judgemental approaches, particularly when using downstream information in forecasting, and that univariate methods remain prevalent. Companies heavily engaged in CIS are likely to generate more granular forecasts both in the time buckets used and the level of channel aggregation. Forecasters indicate that more downstream data and closer collaboration with customers are the most important factors in improving forecasting accuracy.

13:35 - 14:35 **WHAT FORECASTING INFORMATION IS BEST FOR DECISION MAKERS?** Room Maine
Chairperson: J Keith Ord, Georgetown University
Organizer: J Keith Ord, Georgetown University

EFFECT OF INFORMATION ON STATISTICAL SIGNIFICANCE VS EMPIRICAL PREDICTION INTERVALS ON INVESTMENT DECISIONS
Kesten Green, University of South Australia

Researchers often provide business managers with statistical significance information for the estimates they obtain from surveys. Do managers use the information appropriately when the estimates are forecasts of demand and they must make risky investment decisions? Empirical prediction intervals (e.g. "from experience of previous forecasts, the actual figure is likely to be within this range 80% of the time") are an obvious information benchmark. Subjects were presented with a set of investment decisions including point forecasts of demand. Most subjects were also given either statistical significance information or empirical prediction intervals. Our findings provide evidence on whether managers are misled by statistical significance information compared to those who were given empirical prediction intervals or point forecasts only. In particular, we examine whether subjects presented with statistical significance information more often reject an investment with a forecast return that is not statistically significant, and whether they more often invest when the forecast return is statistically significant.

THE ILLUSION OF PREDICTABILITY: HOW REGRESSION STATISTICS MISLEAD EXPERTS
Robin Hogarth, ICREA & Universitat Pompeu Fabra
Co-Author(s): Emre Soyer, Universitat Pompeu Fabra

Does the manner in which results are presented in empirical studies affect perceptions of the predictability of the outcomes? Noting the predominant role of linear regression analysis in empirical economics, we asked 257 academic economists to make probabilistic inferences given different presentations of the outputs of this statistical tool. Questions concerned the distribution of the dependent variable conditional on known values of the independent variable. Answers based on the presentation mode that is standard in the literature led to an illusion of predictability; outcomes were perceived to be more predictable than could be justified by the model. In particular, many respondents failed to take the error term into account. Adding graphs did not improve inferences. Paradoxically, when only graphs were provided (i.e., no regression statistics), respondents were more accurate. The implications of our study suggest, inter alia, the need to reconsider how to present empirical results and the possible provision of easy-to-use simulation tools that would enable readers of empirical papers to make accurate inferences.

THE ILLUSION OF PREDICTABILITY: A FOLLOW-UP STUDY
J Keith Ord, Georgetown University

A study by Soyer and Hogarth (to appear in the International Journal of Forecasting, 2012) revealed that professional economists typically underestimate the uncertainty in forecasts when presented with the numerical information that is provided in economics journals. These findings raise a number of questions: (1) Can the numerical information provided be improved so that assessments become more accurate? (2) How much expertise is required for an individual to make accurate assessments? (3) Are graphical presentations more accurate and, if so, what form should they take. The paper will report on experiments undertaken to examine these issues.

14:40 - 15:25 **SALES AND OPERATIONS PLANNING 5** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

ACHIEVING S&OP MATURITY
Noha Tohamy, Gartner, Supply Chain

Companies that do S&OP well testify to the predictability and transparency it brings to the business, but mostly in the later stages of the maturity curve. Gartner research has found that 67 percent of companies remain in Stage 1 or 2 of our four-stage S&OP maturity model. How exactly do companies move beyond Stage 2, and how do they sustain the process? This talk will explain the four-stage S&OP maturity model, and will show what research has found about:
1. What it takes to advance in the S&OP maturity model?
2. Whether S&OP should follow a standard approach, or be tailored to specific areas of a business?
3. What companies are doing to overcome obstacles in achieving S&OP maturity?
4. What role does finance or financial integration typically play in deriving greater value from S&OP?

14:40 - 15:25 **ESTIMATING RECENT AND CURRENT MACROECOMIC TRENDS B** Room Simmons
Chairperson: Dominique Guegan, University Paris1 Pantheon-Sorbonne
Organizer: Filippo Moauro, Eurostat

NOWCASTING THE DISTRIBUTION OF GDP
Kajal Lahiri, University at Albany
Co-Author(s): George Monokroussos, University at Albany

In this paper we revisit the task of nowcasting GDP using large unbalanced (jagged edge) macroeconomic datasets. We propose a Gibbs sampling algorithm that encompasses the central features of the existing nowcasting literature, and especially its dynamic factors, which we generate here in one multi-move block. Compared to much of the existing literature, our approach has several desirable characteristics, including that it delivers the entire (posterior) distribution of GDP nowcasts, and that it can be easily augmented to "fill in" missing observations through data augmentation or to include nonlinear time series features. We employ our approach to investigate the role the role of the well-known monthly diffusion indices produced by the Institute for Supply Management (ISM) in nowcasting current quarter US GDP growth.

REAL TIME MONITORING WORLD GDP AND TRADE

Roberto Golinelli, University of Bologna
Co-Author(s): Alessandro Borin, Bank of Italy, Riccardo Cristadoro, Bank of Italy and Giuseppe Parigi, Bank of Italy

The assessment of current and future world economic developments is a central concern for international financial institutions, governments and central banks. In the last twenty years, the rapid growth of emerging countries such as Brazil, Russia, India and China (i.e. the so called BRIC countries) has deeply changed the economic landscape: their aggregate GDP now accounts for more than a quarter of world output, whereas it was about 14% in 1992. Although reliable models and data are available since a quite long time to analyze cyclical developments of the advanced countries in a timely and comprehensive fashion, this is not the case for emerging economies: even the most recent literature still analyses and forecasts world economic trends focusing either on the G7 or at most on the OECD group of countries (see e.g. Arouba et al., 2010, Kose et al.,2008, Golinelli and Parigi, 2007, and Chauvet and Yu, 2006).

The recent experience of failures in assessing present and future global economic developments asks for frequent forecast updates in a rapidly changing environment. However, updating predictions is far from being an easy task, as it usually implies the maintenance and estimation of high dimension models, as well as very complex data base.

In this paper we introduce an easy, almost automatic, way of obtaining a monthly assessment of global perspectives in the short run for quarterly GDP and world trade by exploiting BRIC statistical information jointly with that of developed countries. While the use of the econometric tools in this paper is not a novelty for the advanced countries, to our knowledge this is the first time that monthly forecasts of GDP and trade growth rates are introduced for both advanced and emerging markets.

The forecasting framework we set up is accomplished in the following two steps.

First, we estimate very simple bridge models (BM) for main advanced (European Union, Japan, USA) and emerging (Brazil, Russia, India and China) countries/areas. BM are equations where the information content of few short run indicators is 'translated' into the more coherent and complete 'language' of national accounts' GDP and deflators. In this paper, our BM are based on monthly industrial production (to forecast GDP), and consumer price inflation/bilateral exchange rates (to forecast deflators) in order to show the advantage of our approach over benchmark models without unavoidably incurring in criticisms of "data mining". Then, we obtain BM forecasts up to six quarters ahead for both GDP levels and domestic/import inflation rates. The world GDP growth – derived from the aggregation of the growth rates of these seven countries/areas – gives a monthly assessment of short run global perspectives which can update the less frequent forecasts delivered by institutes that use more complex models.

Second, we estimated very simple quarterly equations which explain imports with GDP and relative prices (see e.g. Levchenko et al., 2010, and Bussiere et al. 2011) for the seven countries/areas above. Feeding these import functions with the forecasts obtained at the first step, we can forecast the world trade over the same horizon.

14:40 - 15:25 **GOVERNMENT DEBT** Room Hyannis
Chairperson: Andrew Martinez, George Washington University

GOVERNMENT DEBT AND MACROECONOMIC ACTIVITY: A PREDICTIVE PANEL REGRESSION ANALYSIS FOR ADVANCED ECONOMIES
Deniz Baglan, Howard University
Co-Author(s): Emre Yoldas, Board of Governors of the Federal Reserve System

In the aftermath of the global financial crisis, ratio of government debt to GDP surged in most advanced economies due to plummeting economic activity, high levels of stimulus spending to counter it, and direct costs of stabilizing the financial system. Increasing public indebtedness may lead to weaker macroeconomic performance through a variety of channels, such as higher uncertainty resulting in lower investment by firms. Our paper contributes to a growing literature on exploring empirical implications of higher levels of government debt relative to total income for macroeconomic activity. We focus on the short to medium-run nature of this relationship by using the comprehensive Reinhart-Rogoff data set for twenty advanced economies spanning the entire post war era. We adopt a predictive panel-regression framework and explicitly deal with inference issues due to the persistent nature of debt-to GDP ratio as an endogenous predictor. Our results show that the sign and magnitude of the predictive coefficient on debt-to GDP ratio changes dramatically when one switches from conventional to robust inference techniques. We also find that a higher debt-to GDP ratio predicts faster GDP growth but the implied growth rate slows substantially as public indebtedness increase relative to total output.

COMPARING GOVERNMENT FORECASTS OF THE UNITED STATES' GROSS FEDERAL DEBT
Andrew Martinez, George Washington University

This paper compares annual one-step-ahead forecasts from the Congressional Budget Office and the Office of Management and Budget for the United States' gross federal debt from 1984 to 2010. While comparisons of these agencies' forecasts have been done before, those comparisons have not focused on debt. This paper finds that both agencies do a good job of forecasting the debt except during recessions. Each agency's forecast lacks something that the other accounts for, and an average of both out performs either individually. However, CBO's Analysis of the President's Budget, which includes information from both agencies, performs best.

14:40 - 15:25 **MIXED FREQUENCY FORECASTING** Room Tufts
Chairperson: Pierre Guérin, Bank of Canada

FORECASTING WITH MIXED FREQUENCY SAMPLES: THE CASE OF MULTIPLE COMMON TRENDS
Peter Fuleky, University of Hawaii
Co-Author(s): Carl Bonham, University of Hawaii

We analyze the forecasting performance of small mixed frequency factor models when the observed variables share stochastic trends. We show that in the presence of common stochastic trends the stationary single-factor models that are frequently used to extract coincident indicators are miss-specified. In contrast to the existing literature, we allow for multiple common factors to capture potential cointegrating relationships among the levels of the observed variables, and find that allowing for common trends improves forecasting performance over a stationary single-factor model. The common-trends factor model outperforms the stationary single-factor model at all analyzed forecast horizons on a root mean squared error basis. Our results suggest that when the constituent mixed frequency variables are cointegrated, modeling common stochastic trends can improve forecasts.

MARKOV-SWITCHING MIDAS MODELS
Pierre Guérin, Bank of Canada
Co-Author(s): Massimiliano Marcellino, European University Institute

This paper introduces a new regression model - Markov-switching mixed data sampling (MS-MIDAS) - that incorporates regime changes in the parameters of the mixed data sampling (MIDAS) models and allows for the use of mixed-frequency data in Markov-switching models. After a discussion of estimation and inference for MS-MIDAS, and a small sample simulation based evaluation, the MS-MIDAS model is applied to the prediction of the US economic activity, in terms both of quantitative forecasts of the aggregate economic activity and of the prediction of the business cycle regimes. Both simulation and empirical results indicate that MS-MIDAS is a very useful specification.

14:40 - 15:25 **STATE SPACE MODELS** Room Regis
Chairperson: Nikolaos Zirogiannis, University of Massachusetts, Amherst

DETERMINING THE SOURCE OF HETEROSCEDASTICITY IN UNOBSERVED COMPONENT MODELS
Alejandro Rodriguez, Universidad de Concepción
Co-Author(s): Guillermo Ferreira, Universidad de Concepción

In the context of time series analysis, conditional heteroscedasticity has an important impact on the coverage of prediction intervals. Moreover, when prediction intervals are constructed using unobserved component models (UCM) the problem increases. This is due to the possible existence of several components which may or may not be conditional heteroscedastic and consequently, the true coverage depends on the correct identification of the source of the heteroscedasticity. There are proposals for testing homoscedasticity applied to the auxiliary residuals of the UCM; however, in most cases, these procedures are not able, on average, to correctly identify the heteroscedastic component. The problem is associated with transmission of heteroscedasticity among the auxiliary residuals, this transmission may generate a wrongly identification of heteroscedasticity in the component with constant conditional variance. The idea of this paper is to focus on eliminating the transmission and then, using the auxiliary residuals, correctly identifies the conditional heteroscedastic component. Simulation results show an improvement in the power and the size of several homoscedasticity tests.

ESTIMATING AND FORECASTING AN UNOBSERVED INDEX: A STATE SPACE MODEL WITH A FACTOR ANALYTIC COMPONENT
Nikolaos Zirogiannis, University of Massachusetts, Amherst
Co-Author(s): Alexander Danilenko, World Bank, Joe Moffitt, University of Massachusetts, Amherst and Yorghos Tripodis, Boston University

We develop a state space model that includes a factor analytic component with the goal of estimating an unobserved index and forecasting it's future course. While similar models have been developed in the literature of dynamic factor analysis, our contribution is twofold. First, contrary to simple dynamic factor analysis where we have multiple variables of the same subject measured at each time period, our model also accounts for multiple subjects. It is thus applicable to a panel data framework (i.e. multiple variables for multiple subjects observed over time). Furthermore, our model calculates an unobserved index for every subject in every time period, as opposed to previous work where a single unobserved index was calculated for all subjects in every time period. Finally we develop an estimation framework that is flexible enough to adapt to any type of dataset. The model is applied on a dataset with information of the performance of water utilities in developing countries. The goal of the estimation is to create a leading benchmarking index that will predict the ability of a utility to cope with external stresses.

Keywords: State Space models, Dynamic Factor Analysis, Panel Data, EM algorithm, Leading indicator, Water utilities

14:40 - 15:25 **STATISTICAL SIGNIFICANCE OF FORECASTING METHODS** Room New Hampshire

Chairperson: Michele Hibon, INSEAD

THE NULL HYPOTHESIS: YOUR FORECASTING PROCESS HAS NO EFFECT

Michael Gilliland, SAS Institute

Forecasting process performance should be evaluated with respect to the null hypothesis that the process has no effect -- that it fails to perform any better than a naive model. This presentation shows how Forecast Value Added (FVA) analysis and simple methods from statistical process control can identify process activities that are failing to improve the forecast. Eliminating the non-value adding efforts can lead to better forecasts, with fewer organizational resources committed to forecasting.

STATISTICAL SIGNIFICANCE OF FORECASTING METHODS - AN EMPIRICAL EVALUATION OF THE ROBUSTNESS AND INTERPRETABILITY OF THE MCB, ANOM AND FRIEDMAN-NEMENYI TEST

Michele Hibon, INSEAD
Co-Author(s): Sven F. Crone, Lancaster University Management School and Nikolaos Kourentzes, Lancaster University

The series of M-competitions (1982, 1993,2000) have firmly established forecasting competitions as an objective approach to assess the empirical ex ante accuracy of competing forecasting methods. While the original M-competitions merely ranked algorithms by performance , Koning et al. (2005) assessed the results of M3 for the significance of the error differences using two non-parametric statistical tests: multiple comparisons with the mean (ANOM) and multiple comparisons with the best (MCB). As a result, they identified few methods which significantly outperformed all others.

However, MCB and ANOM have been subject to criticism due to their sensitivity to sample size of methods assessed and their limited interpretability, as both provide only a binary classification whether a model is significantly “better” or “worse” to the average (ANOM) or the best (MCB) performance of all models. This does not provide information on how individual models differ within each of these classes, and whether such differences are significant. To overcome these limitations, the Friedman and Nemenyi test has been proposed (Demsar, 2006), which is frequently employed in model comparisons in data mining ad machine learning.

We empirically assess (a) the robustness of ANOM and MCB in comparison to the Friedman and Nemenyi test, and (b) the interpretability of results of the significantly different subgroups. As a dataset, this study revisits the results of the recent NN3 competition by Crone et al. (2011), which extended the M3 competition to 59 new algorithms of computational intelligence in comparison to a subset of the 5 best models originally submitted to M3, evaluated on two masked subsets of 111 and 11 empirical time series of monthly M3 industry data. We assess the robustness of the statistical tests (1) on the error measure that is used to derive model ranks and provide suggestions, (2) their the sensitivity to the number of included models by including all contenders of the M3, and (3) their sensitivity to the number of time series compared. As a result we derive the robustness of each test for performance evaluations in competitions as well as empirical simulation studies of forecasting.

14:40 - 15:25 **STOCK MARKETS A** Room Massachusetts

Chairperson: Marco Caetano, INSPER Instituto de Ensino e Pesquisa

FORECASTING WITH THE ELLIOTT WAVE MODEL: DISTINGUISHING ACTUAL FROM PERMUTED STOCK MARKET PRICE CHANGES

Idan Hodor, Socionomics Institute and Matthew Lampert, University of Cambridge
Co-Author(s): Deepak Goel, Socionomics Institute and Robert Prechter, Socionomics Institute

The Elliott wave model is an empirically-derived, hierarchical-fractal model of financial price fluctuation with a 75-year history of application among financial forecasting practitioners. In this paper, we employ an expert system, EWAVES, to score stock index price series' conformity to the Elliott wave model's description of wave forms via its rules and guidelines. We use EWAVES to score the daily price series, from 2005-2010, of the 18 national stock indexes on Bloomberg's list of World Market Indexes. We compare these results to EWAVES' scores of permutations of the same daily prices for each series. Results show that actual daily price series achieve higher scores than the random permutations to an extent greater than chance allows, thereby indicating their greater affinity to the Elliott wave model. We conclude that Elliott's model may describe aspects of sequences of daily returns in stock prices not currently captured in reigning financial models. Our results bolster the Elliott wave model as a description of market behavior and suggest a fruitful line of inquiry for further testing.

FORECASTING SHORT TERM ABRUPT CHANGES IN THE STOCK MARKET WITH WAVELET DECOMPOSITION AND GRAPH THEORY

Marco Caetano, INSPER Instituto de Ensino e Pesquisa
Co-Author(s): Takashi Yoneyama, ITA

After the financial crisis of 2008 the researches about causes and consequences increased in all sector of world market. The intuition of systemic risk and connection among the stock markets led several analysts to observe the network theory as possible explanation of abrupt changes in financial markets. This work propose a new methodology to detect the abrupt changes in the stock market by combining a numerical indicator based on the wavelet decomposition technique with a measure of the interdependency of the markets using graph theory. The indicator based on wavelet decomposition to measure abrupt changes in stock market was presented by authors in others works and showed good coherence with actual data. The idea in this work is to observe the behavior of stock market with its links and correlations using network and graph theory. An association is made between level of connection in all nodes of network and the measure of stress in market using indicator of decomposition wavelet. Experimentations are made with a variety of financial time series using actual data of the Brazilian stock market (BOVESPA). A case study involving nine shares of stock market is presented in the analyzing the imminence of a drawdown.

14:40 - 15:25 **TRANSPORTATION FORECASTING A** Room Boston Univ
Chairperson: Tsung-Hsien Tsai, Department of Tourism Management, National Quemoy University

FORECASTING CONTAINER THROUGHPUT WITHIN MULTI-PORT REGION
Jiawei Zhang, Chinese Academy of Sciences
Co-Author(s): Li Yang, Tsinghua University and Xun Zhang, Chinese Academy of Sciences

A three-module model is devised and evaluated to combine forecasts of container throughput volumes in the Pearl River Delta (PRD) region of China. The proposed model includes: a container throughput module which considers both interactions among ports and other influence factors, a demand-oriented module which provides additional information and chance events effect had on the maritime industries. The main purpose of this paper is to forecast container throughput volumes within Multi-Port Region(MPR) in the PRD region after global financial crisis and evaluate the benefit of combining forecasts. To evaluate the forecasting performance of this model, we compare its performance with those of ARIMA, VEC and VAR. The empirical results demonstrated combination forecast substantially outperforms single-model methods. The study for PRD region also confirms the necessity of analyzing and forecasting from a multi-port region perspective.

A SELF-LEARNED ADVANCED BOOKING MODEL TO FORECAST RAILWAY ARRIVALS
Tsung-Hsien Tsai, Department of Tourism Management, National Quemoy University

This paper utilizes data collected during the booking period and presents a novel advanced booking model to predict railway arrivals. As the date is approaching the departure day, more and more booking information is cumulated in the railway database. We extract useful patterns based on temporal features and formulate a two-stage model. The first stage evaluates the similarity among booking curves which describe the variation of passenger behavior. Then a group of samples which are similar to the booking patterns of the forecast target are chosen to project the prediction value based on a weighted scheme. Since the proposed model has several parameters for capturing the distinctive influence of temporal features, a direct search method is incorporated to determine the values of the parameters in the second stage. In addition, two common advanced booking models termed pick-up model and regression are also constructed in this study for comparative purposes. The results show that the proposed model may achieve at least 18% improvement in terms of predictive accuracy comparing with the benchmarks. However, more evidences are needed to validate the capability of the proposed concept in the future.

14:40 - 15:25 **YIELD CURVES** Room Maine
Chairperson: Andrey Vasnev, University of Sydney

PREDICTING OUTPUT USING THE ENTIRE YIELD CURVE
Azamat Abdymomunov, Federal Reserve Bank of Richmond

Many studies find that yields for government bonds predict real economic activity. Most of these studies use the yield spread, defined as the difference between two yields of specific maturities, to predict output. In this paper, I propose a different approach that makes use of information contained in the entire term structure of U.S. Treasury yields to predict U.S. real GDP growth. My proposed dynamic yield curve model produces better out-of-sample forecasts of real GDP than those produced by the traditional yield spread model. The main source of this improvement is in the dynamic approach to constructing forecasts
versus the direct forecasting approach used in the traditional yield spread model. Although the predictive power of the yield curve for output is concentrated in the yield spread, there is also a gain from using information in the curvature factor for the real GDP growth prediction.

PRACTICAL USE OF SENSITIVITY IN ECONOMETRICS WITH AN ILLUSTRATION FOR FORECAST COMBINATIONS
Andrey Vasnev, University of Sydney
Co-Author(s): Jan Magnus, Tilburg University

We consider practical use of the sensitivity measure studied by Magnus and Vasnev (2007). For this purpose we distinguish between absolute and relative sensitivity and highlight the context dependent nature of the sensitivity analysis. Relative sensitivity is then applied in the context of forecast combination and sensitivity based weights are introduced. All concepts are illustrated with the help of the European yield curve example. In this context it is natural to look at sensitivity to autocorrelation and normality assumptions. Different forecasting models are combined with equal, fit based and sensitivity based weights and compared against the multivariate and random walk benchmarks. We show that the fit based weights and the sensitivity based weights are complimentary.

15:50 - 17:40 **SALES AND OPERATIONS PLANNING 6** Room Suffolk
Chairperson: Bob Stahl, R.A. Stahl Company
Organizer: Len Tashman, Editor of Foresight

Q&A SESSION WITH OUR S&OP PANEL OF EXPERTS
Bob Stahl, R.A. Stahl Company
Discussant(s): Indar Chaudhuri, Daiichi Sankyo, Phil Dolci, Jarden Branded Consumables Group, Jeff Greer, KVH Industries, Amy Mansfield, V&M Star, Brad McCollum, Jarden Branded Consumables and Noha Tohamy, Gartner, Supply Chain

Don"t miss this unique opportunity to ask your S&OP questions of this successful group of S&OP experts -- all of today"s practitioner speakers. Questions about the talks of the day, or specific questions about the circumstances back at your company, are all within scope.

15:50 - 16:35 **ANALYSING FORECASTERS A** Room Massachusetts
Chairperson: Antoine Blais, Hankuk University of Foreign Studies, Seoul

HOW TO BEAT THE MEAN SURVEY FORECAST?
Victor Hoornweg, Erasmus University Rotterdam
Co-Author(s): Ph.H.B.F. Franses, Erasmus University Rotterdam

The challenge in making optimal use of survey forecasts lies in the frequent entry and exit of individual forecasters. An equal weighted average of the forecasts is generally used. Recently, Capistrán and Timmermann (2009) explored a variety of methods to improve the mean forecast of the Survey of Professional Forecasters. They document that a bias-adjusted average forecast marginally improves the benchmark and conclude, in line with previous research, that the "equal-weighted forecast turns out to be extraordinarily difficult to beat." In this paper we aim to challenge this conclusion. The main strategy we employ is to rank forecasters based on their previous forecasting errors and to take a weighted average of the best ranked forecasters. This simple approach can be carried out in a variety of ways: one can vary the amount of prediction errors that are considered when ranking the forecasters, one can vary the number of best-ranked experts that receive a non-zero weight, etc. The novelty of our approach is that we produce a large amount of such variations and construct an automated system which dynamically selects and combines the best performing restrictions. We demonstrate that the benchmark-models can be beaten for variables like inflation and government spending.

THE MEASUREMENT AND BEHAVIOR OF UNCERTAINTY: EVIDENCE FROM THE ECB SURVEY OF PROFESSIONAL FORECASTERS
Robert Rich, Federal Reserve Bank of New York
Co-Author(s): Joseph Tracy, Federal Reserve Bank of New York

We use matched point and density forecasts of output and inflation from the ECB Survey of Professional Forecasters to derive measures of forecast uncertainty, forecast dispersion and forecast accuracy. We construct forecast uncertainty measures from aggregate density functions as well as from individual point forecasts and histograms. There is evidence of a modest increase in forecast uncertainty for output and inflation since 2007. The results also indicate that uncertainty displays a very weak relationship with forecast dispersion, corroborating the findings of other recent studies that disagreement is not a valid proxy for uncertainty. In addition, we find little correspondence between uncertainty and predictive accuracy, the later serving as the basis to construct time-varying residual variance model estimates. Last, using a regression equation that can be interpreted as a (G)ARCH-M-type model, we find mixed support for evidence of linkages between uncertainty and levels of output growth and inflation.

15:50 - 16:35 **COMMON FEATURES** Room Regis
Chairperson: Dao Li, Dalarna University

ON THE ISSUE OF HOW MANY VARIABLES TO USE WHEN ESTIMATING COMMON FACTORS USING THE KALMAN FILTER
Pilar Poncela, Universidad Autónoma de Madrid
Co-Author(s): Esther Ruiz, -

The Kalman filter yields consistent estimates of the underlying factors in the context of dynamic factor models when the cross-sectional and time dimensions tend to infinity. In this paper, we analyze the properties of the estimated factors when both dimensions are finite. First, we consider the properties of the Kalman filter estimates when the parameters are known and show that the filter uncertainty decrease very
quickly with the number of variables in the system. Consequently, regardless of the dynamic dependence of the factor and that of the idiosyncratic noises, if the number of variables is beyond a relative small, the uncertainty only decreases marginally. Then, we also show how the uncertainty of the parameter estimation affects the Kalman .lter Mean Square Errors.

FORECASTING MACROECONOMIC SYSTEMS WITH NONLINEAR TIME SERIES MODELS CONTAINING COMMON FEATURES
Dao Li, Dalarna University

This paper concerns forecasting macroeconomic systems with nonlinear time series models containing common features. It is included for different horizons that point forecasts and the density forecasts via the generalized impulse response to the shocks (positive and negative). Furthermore, the evaluations of point forecast accuracy are studied by Diebold-Mariano type tests. Empirical applications suggest that nonlinear models could at least contribute more information to the combined forecast which outperforms pure linear models in most cases.

15:50 - 16:35 **ESTIMATING RECENT AND CURRENT MACROECOMIC TRENDS C** Room Simmons

Chairperson: Dominique Guegan, University Paris1 Pantheon-Sorbonne
Organizer: Filippo Moauro, Eurostat

NOWCASTING WITH DAILY DATA

Domenico Giannone, Université Libre de Bruxelles - ECARES
Co-Author(s): Marta Banbura, European Central Bank, Michele Modugno, Universite' Libre de Bruxelles - ECARES and Lucrezia Reichlin, London Business School

This article has been written for the second volume of the North Holland Handbook of Economic Forecasting. It first reviews the basic concepts and problems related to now-casting which is defined as forecasting at short horizons in the presence of real-time data flow. The discussion is focused on now-casting quarterly GDP growth, but the methodology could be easily applied for other low frequency variables for which higher frequency information is available. We recall the framework developed by Giannone, Reichlin and Small (2008) along with subsequent extensions, which allows to produce now-casts in an automatic and efficient manner as well as to interpret data releases in terms of their implication for the now-cast revisions. The empirical application extends on previous studies along the following lines. First, we consider daily and weekly data along monthly and quarterly ones. Second, we have confirm previous heuristic results that accruing information improves now-cast precision by means of formal tests. Third, we establish that daily financial variables do not help improving the precision of the GDP now-cast once the timeliness of monthly macro data is properly accounted for.

ENCOMPASSING TECHNIQUES FOR BUSINESS CYCLE INVESTIGATION

Dominique Guegan, University Paris1 Pantheon-Sorbonne

In this talk we discuss and illustrate alternative methods to study and predict business cycles. We discuss encompassing techniques both for model selection and variable selection and we show the interest of these techniques to the study of the business cycle. This paper provides theoretical and new results on Encompassing tests for parametric and nonparametric models and their implementation in the study of the business cycle. Particular attention is the choice of nonparametric model for forecasting.

15:50 - 16:35 **FORECASTING SUPPORT SYSTEMS A** Room New Hampshire
Chairperson: Paul Goodwin, University of Bath
Organizer: Robert Fildes, Lancaster University Centre for Forecasting and Paul Goodwin, University of Bath

COMBINING STATISTICAL AND JUDGMENTAL FORECASTS VIA A WEB-BASED TOURISM DEMAND FORECASTING SYSTEM
Haiyan Song, School of Hotel and Tourism Management,The Hong Kong Polytechnic University
Co-Author(s): Zixuan Gao, School of Hotel and Tourism Management,The Hong Kong Polytechnic University and Shanshan Lin, The Hong Kong Polytechnic University

This paper introduces a web-based tourism demand forecasting system (TDFS) that is designed to forecast the demand for Hong Kong tourism as measured by tourist arrivals, total and sectoral tourist expenditures, and the demand for hotel rooms. The TDFS process comprises three stages, preliminary data analysis, generation of quantitative forecasts and judgmental adjustments, which correspond to the three key system components: the data module, quantitative forecasting module and judgmental forecasting module, respectively. These stages (modules) interact with one another. This paper focuses on a recent case study that illustrates the functional ability of the TDFS as a support system that provides accurate forecasts of the demand for Hong Kong tourism. Specifically, the quantitative forecasts are generated by the autoregressive distributed lag model and are then adjusted by a panel of experts comprising postgraduate students and academic staff. The results show that the combination of quantitative and judgmental forecasts improves overall forecasting accuracy.

WHY UNDERSTANDING TIME SERIES COMPLEXITY MATTERS FOR FSS DESIGN: EVIDENCE FROM TWO EXPERIMENTAL VALIDATIONS
Monica Adya, Marquette University
Co-Author(s): Edward Lusk, SUNY Plattsburgh; University of Pennsylvania

Not all forecasting tasks require the same decision support. We present evidence from 3 studies that (i) complexity of the forecasting task demands differential treatment in terms of decision support and (ii) adaptive FSS needs to successfully tailor the support to the decision needs on hand. To this end, we first present a complexity taxonomy to classify time series tasks from simple to complex, using features of time series identified in Collopy & Armstrong (1992). Next, we validate this taxonomy using coincident validity in two studies - one that examines implications of task complexity on judgmental and FSS forecasts, and a second that studies its effect on adjustment behaviors. Coincident validity of the proposed taxonomy is implied in forecasting performance i.e. simpler series should be more accurately forecast than complex series. Results validate our taxonomy - judgmental and FSS forecast accuracy is lower for complex tasks as opposed to simple ones. Surprisingly, forecasters made more aggressive adjustments to complex tasks as compared to simple ones. However, while their adjustment of FSS generated forecasts improved accuracy of complex series, they harmed accuracy of simple series. Results suggest that level of complexity requires active consideration as a design parameter for FSS. These results as well as future research directions will be discussed.

15:50 - 16:35 **INTERESTRATES** Room Tufts
Chairperson: Alexandre Carvalho, Federal University of ABC

ANNOUNCEMENTS OF THE INTEREST RATE PATH: INFORMATIONAL CONTENT AND ADHERENCE
Nikola Mirkov, University of St.Gallen

This study shows that announcements of future policy rate might convey valuable information for middle-range forecasts beyond that contained in the yield curve. The relative accuracy of the "base line" policy rate path published by the Norges Bank is analysed against the short-rate (point) forecasts from the models of Diebold & Li (2006) and Joslin, Singleton and Zhu (2011) and against the cross-section of extracted forward rates. The path predictions seem to outperform the competing forecasts for the horizons of 9 to 18 months. The main result is independent of whether there is a structural break in the data, namely the dramatic events of 2008, or if the path predictions are in the forecaster's information set. The predictive power of the announced path might be given by adherence of the policy maker to previously announced paths, but only at shorter horizons.

INTEREST RATE MARKET FORECASTS AND TAYLOR RULES IN LATIN AMERICAN COUNTRIES
Alexandre Carvalho, Federal University of ABC

In this study we estimated Taylor rules using the Consensus Economic Forecasts database for Argentina, Brazil, Chile and Mexico, the four largest Latin American economies, aiming to verify whether financial market analysts incorporate Taylor rules at the time of forecasting interest rates. We seek thus to identify the market perceptions about monetary policy in these countries, since it would only make sense for market analysts to incorporate interest rules in their own forecasts, at least implicitly, if they realize that a central bank's behavior is consistent with such rules. We applied the Generalized Method of Moments (GMM) to avoid endogeneity bias, and used real-time data of the output-gap for Brazil and Mexico. Our findings indicate that, except for Mexico, interest rates market forecasts can be explained by Taylor rules. Financial analysts in Brazil and Chile expect the Taylor principle to be respected, but with a lower level of confidence than found in previous works, a result consistent with the tougher monetary policy trade-offs these countries have faced in recent years.

15:50 - 16:35 **JUDGMENTAL FORECASTING A** Room Maine
Chairperson: Edward Raupp, The University of Georgia (Tbilisi)

FILTERING PROCESSED CONTENT IN SENTIMENT ANALYSIS TO SUPPORT THE IMPROVEMENT OF FORECASTING ACCURACY THROUGH JUDGMENTAL FACTORS
Mike Nikitas, National Technical University of Athens
Co-Author(s): Vassileios Assimakopoulos, NTUA

The process of improving forecasting accuracy through judgment implies many complex workarounds in order to map human intentions to discrete signals. The majority of forecasting techniques require decisions based on judgment and any quantification attempt can be characterized as a great research challenge. Through the current work, we try to improve usage of sentiment analysis research tools, by providing content filtering techniques. Mined polarity, sustainability, popularity and affectability of published text could provide useful methodologies to filter content that will be used as input in sentiment analysis engines. The submission of targeted and domain specific content could assist accuracy and identify more correlations between featured metrics. The approach of filtering content is almost inevitable, as the main source of gathering text would be internet. Unstructured, unsorted and domain irrelevant text should be properly selected, categorized and filtered to provide text analysis metrics useful for statistical correlation.

USING AUTO-UPDATING TO AUGMENT EXPERT JUDGMENT FORECASTS
John Regan, Draper Laboratory
Co-Author(s): John Irvine, Draper Laboratory and Srinivasamurthy Prakash, Draper Laboratory

Given a pool of forecasters and their individual predictions about a future event, it is challenging to aggregate the forecasts into an accurate overall prediction. The problem is made even harder by the complexities associated with response times and updated predictions. The further in advance an accurate prediction can be achieved, the more valuable the forecast becomes, and as a result, our problem statement changes from "accurately predict the event outcome" to "accurately predict the event outcome as soon as possible." One major hurdle to overcome in this case is infrequent forecast updating by the respondents, an issue we address in this paper with auto-updating procedures designed to extrapolate forecasts to conform to the shifting time horizon for the forecasts. We apply auto-updating to a class of forecasting problems with the potential to resolve prior to an arbitrary closing date. We focus our analysis on the comparison between linear and exponential auto-date schemes and the forecaster-dependent, unweighted linear moving average to see which most rapidly converges to the correct forecast.

15:50 - 16:35 **TRANSPORTATION FORECASTING B** Room Boston Univ
Chairperson: Champion Lee, Beijing Jiaotong University

CONTAINER THROUGHPUT FORECASTING BY USING A HYBRID SEASONAL DECOMPOSITION AND LSSVR APPROACH
Gang Xie, Academy of Mathematics and Systems Science, Chinese Academy of Sciences

In this study, using hybrid multiplicative seasonal decomposition (SD) and least squares support vector regression (LSSVR) approaches, we forecast container throughput at ports. First, seasonal autoregressive integrated moving average (SARIMA) model, SD and LSSVR are introduced. Second, three hybrid approaches, SARIMA-LSSVR, SD-LSSVR-MUL and SD-LSSVR-LSSVR, are proposed for container throughput forecasting. Then, taking the time series of container throughput at Shanghai port as an example, we illustrate the proposed approaches. The results suggest that SD-LSSVR-MUL has the highest accuracy performance in an out-of-sample test, while SD-LSSVR-LSSVR is the best when in-sample test is implemented.

DYNAMIC VS. STATIC COMBINING FORECASTS METHODS: EVIDENCE FROM CHINA RAILWAY PASSENGER TURNOVER VOLUME FORECASTING
Champion Lee, Beijing Jiaotong University

Combining forecasts has been proved by many researchers and practitioners to be an effective way to improve forecasting accuracy. In this paper, we categorize three combining methods, namely the Bayesian approach, ordinary least squares (OLS) regression and minimized error variance, into two groups: the first one is dynamic and the other two are static. The major feature of dynamic combination is that the weights of each local forecast are adjustable according to the precision of corresponding model. We use national railway passenger turnover volume of China as the test data of the comparison. The result shows that the dynamic combination outperforms the static ones mainly due to its ability to automatically capture the potential useful information from a seasonally fluctuating time series. Furthermore, we find that the predictive accuracy can be further improved when combining the advantages of these two methods, which in this paper is to use the coefficient of the OLS output as the initial value in Bayesian model.

15:50 - 16:35 **STOCK MARKETS B** Room Hyannis
Chairperson: Renaud Million, Ernst & Young

UNDERSTANDING MARKET CONNECTEDNESS: A MARKOV CHAIN APPROACH
Harald Schmidbauer, Istanbul Bilgi University
Co-Author(s): Angi Roesch, FOM University of Applied Sciences, Munich and Erhan Uluceviz, Istanbul Bilgi University

The degree of connectedness of equity markets on a given day can be assessed by decomposing the forecast error variance resulting from a vector autoregressive model, applied to daily returns on stock indices. This well-known procedure leads, for each day, to a spillover matrix quantifying the contribution of a shock, to which one return series is exposed, to future variability of other return series. A spillover matrix can be interpreted as a network and summarized into the spillover index, to which much recent research has been devoted.

Taking a sequence of spillover matrices as starting point, we show how the scope of this concept can be broadened in two directions. Firstly, we demonstrate how the eigenvector structure of spillover matrices contributes to assessing market interaction. Secondly, adopting a Markov chain perspective, we obtain a dynamic description of connectedness which can be analyzed in terms of various entropy measures. Both suggestions are supported by theoretical arguments as well as empirical evidence, using data from several stock indices. It turns out that the spillover index is only one, and limited, summary measure of market connectedness and its manifold aspects. Finally, we show how the measures we develop can help forecast future market interaction.

MISSING VALUE IMPUTATION IN FINANCIAL TIME SERIES - AN EMPIRICAL STUDY OF 16 AFRICAN STOCK MARKETS
Renaud Million, Ernst & Young
Co-Author(s): Sven F. Crone, Lancaster University Management School and Chipo Mlambo, University of Cape Town

In established financial markets, stocks are traded almost continuously so that missing values of prices are rare, even if measured at intraday intervals. In contrast, in emerging capital markets such as the African stock markets, missing values regularly occur from irregular trading and frequent bank holidays. A recent survey of 16 African stock market indices of the last 10 years shows that 4% to 25% of the total number of observations is missing (Mlambo, 2008). Despite the prevalence of missing values in some African stock market indices, research has largely ignored the issue of data pre-processing in the form of missing value imputation. Missing values of prices may alter the structure of the time series and significantly distort returns, potentially biasing the testing of hypothesis on their efficiency, the identification of the data generating process and the estimation of econometric forecasting models. As different methods to impute missing values may equally distort results, this study assesses the effect of different methods of imputing missing values on distributions of prices and returns.

We consider a balanced experiment of five imputation algorithms to replace

missing values in time series of 16 stock market indices from 12 African countries. Furthermore, to control for the data conditions on imputation methods, all time series are aggregated to assess results on three different time series frequencies of daily, weekly and monthly prices and returns. To assess the effect of different algorithms on both prices and returns, imputation is applied both to time series of daily prices (from which daily returns are later calculated), and directly on daily compound returns. For each series, we assess distortions in the distribution of returns, and test for weak form efficiency using a random walk on different returns frequencies. The study shows substantial distortions by different algorithms, which may yield insights for both developing economics and international investors.

16:40 - 17:40 **ANALYSING FORECASTERS B** Room Massachusetts

Chairperson: Antoine Blais, Hankuk University of Foreign Studies, Seoul

CAN MACROECONOMIC FORECASTERS DISCRIMINATE? EVIDENCE FROM THE SURVEY OF PROFESSIONAL FORECASTERS

Geoffrey Allen, University of Massachusetts Amherst

Discrimination, the ability to forecast high values when actual values are high and low values when actual values are low, is a useful forecast attribute. Thirteen individual forecasters who have participated in the Survey of Professional Forecasters and made at least 60 forecasts showed minimal or no discriminatory ability in forecasting US nominal quarterly GDP growth. Results are based on quarterly data from 1990 to 2010 and apply to “one-step-ahead” forecasts that are actually made halfway through the quarter. Even under this most favorable condition, the forecasts display practically no skill for this forecast attribute. Their combined forecasts have no discriminatory ability either.

WHAT DRIVES EARNINGS FORECASTERS TO GIVE THEIR QUOTES?

Bert de Bruijn, Erasmus Universiteit Rotterdam
Co-Author(s): Philip Hans Franses, Erasmus Universiteit Rotterdam

Earnings forecasts are often analyzed as they can be useful for investment decisions. Most research focuses on the value of the earnings forecasts (Clement, Hales & Xue, 2011; Chen & Jiang, 2006; Bolliger, 2004; Cooper & Lewis, 2001), and to examine which driving factors may explain those forecast and perhaps predict the behavior of the forecasters (are they rational?), where some studies allow that the forecasters can be classified as either leaders or followers (Jegadeesh & Kim, 2010; Clement & Tse, 2005). Recently, a few studies address the timing of the earnings forecasts (Guttman, 2009; Kim, Lobo & Song, 2011). In our paper we also focus on the timing of the quotes, where we will also allow for segments of forecasters with different behavior. For this we propose a mixture duration model specification. As an illustration we analyze earnings forecasts for AMD in the period 1997 to 2011, where the data are obtained from the I/B/E/S database. Our empirical findings suggest clear drivers of the timing of the forecasts and we provide an interpretation to the two distinct groups or forecasters. Hence, we show that not only the forecasts themselves are somehow predictable, we also find that the timing of the quotes is predictable to some extent. We discuss the managerial implications of these findings.

FORECASTS AUTOMATIC EXTRACTION INSIDE ECONOMIC TEXT CORPORA AND THEIR CATEGORIZATION IN AN ONTOLOGY

Antoine Blais, Hankuk University of Foreign Studies, Seoul
Co-Author(s): Aurelien Arena, LALIC laboratory, Paris-Sorbonne University

The present study focuses on how to capture existing verbal forecasts selected from a large corpus of texts, and aims to exploit natural language processing and articifial intelligence techniques for the recognition and extraction of forecasts, as these techniques are designed for doing at present, for opinion or sentiment mining. The textual identification of forecasts is performed in our work by a software application which automatically extracts textual segments containing linguistic forms that express the different types of forecasts and which are present in economic texts (newspapers, reports, journals…). We also seek to categorize textual forecasts inside an OWL ontology describing different varieties of forecasts and textual information associated with extracted forecasts and found in their textual context : degree of certainty, the period over which the forecast is envisaged, tendency, forecast's author… The main goal of this work is to identify one or various future trends associated with a textual economics corpus or to form a new forecast on the basis of a set of forecasts automatically identified inside a large number of documents. An evaluation of our work is presented and ensures the quality of the forecasts' extraction.

16:40 - 17:40 **FORECASTING FINANCIAL STRESS** Room Tufts

Chairperson: Greg Tkacz, St. Francis Xavier University
Organizer: Greg Tkacz, St. Francis Xavier University

A SEMIPARAMETRIC EARLY WARNING MODEL FOR FINANCIAL STRESS EVENTS

Fuchun Li, Bank of canada

In this paper, we use Financial Stress Index, a continuous measure of the current state of stress in the financial system, created by IMF for developed countries to predict the likelihood of occurrence of financial stress events in a given period of time for five developed countries, Canada, France, Germany, United Kingdom, and United States. The model used is a semiparametric panel data model with nonparametric specification of the link functions and linear index function. Even though this kind of semiparametric models are frequently used in the literature of economics and finance, it has not been used in the literature of early warning models. It is advantageous to know what its performance is as an early warning model and to what extent it produces results that are substantially different from those of the most commonly parametric models such as logit and probit. The choice of the explanatory variables is based on the variables in Demirguc-kunt and Detragiache (1998) and Davis and Karim (2008), which are chosen by theoretical consideration and by their availability for all the five countries and time periods. The new specification test proposed in this paper suggests that the data cannot reject the hypothesis that the link functions are the same across the five countries. The empirical results show that the semiparametric early warning model is workable for capturing some well-known financial stress events, and for Canada, United States, United Kingdom, and Germany, the semiparametric model can provide much better out-of-sample predicted

probabilities than the Logit model for the time period from quarter two 2007 to quarter two 2010, while for France, the logit model provides better performance for non-financial stress events than the semiparametric model.

PREDICTING FINANCIAL STRESS: A SIGNAL EXTRACTION APPROACH

Marc Wildi, Zurich University of Applied Sciences
Co-Author(s): Simon van Norden, hec montréal

Basel III requires regulators to predict banking crises years ahead of time. Any increases in the countercyclical buffer need to be preannounced by up to 12 months to give banks time to meet the additional capital requirements before they take effect. Recent research suggests using excessive credit growth as a guide for monitoring capital buffers. Specifically, the Credit-to-GDP gap has proven leading indicator properties for financial distress. We propose measures of excessive credit growth to predict banking crises more reliably based on recent advances in real-time signal extraction. In general terms, we propose to design filters with `desirable' properties - such as timeliness and strong noise-rejection -. Performances of our `customized' designs are compared to a benchmark HP-filter (lambda=400000 as proposed by the Bank for International Settlements), based on a panel of 34 countries from 1959Q1 to 2011Q2.

REAL-TIME COMBINATION FORECASTS OF SPECULATIVE BUBBLES

Greg Tkacz, St. Francis Xavier University
Co-Author(s): James Younker, Bank of Canada

This paper examines approaches to real-time bubble identification, and attempts to evaluate their reliability empirically. Currently most studies have taken one of four general approaches to identifying bubbles; their results are usually encouraging, but not precise enough to be utilized by many central banks or investors. The contribution of this paper is to show how combining the four bubble identification methods can achieve an approach that is more reliable in real-time. Analogous to the literature on combining forecasts from different models, we find that a simple average of the various techniques produces more accurate indicators of speculative bubbles.

16:40 - 17:40 **FORECASTING IN THE VIDEO MARKET: UNIQUE METHODOLOGIES** Room Boston Univ

Chairperson/Organizer: James H Alleman, University of Colorado

FORECASTING VIDEO CORD-CUTTING: AN UPDATE

Aniruddha Banerjee, Centris
Co-Author(s): James H Alleman, University of Colorado and Paul Rappoport, Temple University

This paper is an update of our earlier paper which reports on efforts to forecast the effect of consumer choices on the future of video cord-cutting. Based on a comprehensive tracking survey of households in the United States, the paper presents evidence on household ownership of OTT-enabling devices and subscription to OTT-enabling services, and forecasts their effects on OTT. It also assesses how consumers' OTT choices are determined by household geo-demographic characteristics, device ownership, and subscription history. Ordered logit regressions are used to analyze and forecast future choices of devices and services, and estimate switching probabilities for OTT substitution by different consumer profiles.

REGRESSION WITH A TWO-DIMENSIONAL DEPENDENT VARIABLE

Lester Taylor, University of Arizona

The purpose of this paper is to suggest procedures for dealing with dependent variables in regression models that can be represented as points in the plane. The "trick" is to represent dependent variables in polar coordinates, in which case two-equation models can be specified in which estimation proceeds in terms of functions involving cosines, sines, and radius-vectors. Situations for which this procedure is relevant include analyses of markets in which there are duopoly suppliers. The approach allows for generalization to higher dimensions, and, perhaps most interestingly, can be applied in circumstances in which values of the dependent variable can be points in the complex plane. The procedures are illustrated using cross-sectional data on household toll-calling from a PNR & Associates Bill Harvesting survey of the mid-1990s and data from the BLS Survey of Consumer Expenditures for the fourth quarter of 1999.

16:40 - 17:40 **FORECASTING SUPPORT SYSTEMS B** Room New Hampshire

Chairperson: Paul Goodwin, University of Bath
Organizer: Robert Fildes, Lancaster University Centre for Forecasting and Paul Goodwin, University of Bath

THE SUM AND ITS PARTS: A BEHAVIORAL INVESTIGATION OF TOP-DOWN AND BOTTOM-UP FORECASTING PROCESSES

Enno Siemsen, University of Minnesota
Co-Author(s): Mirko Kremer, Penn State University and Doug Thomas, Penn State University

Many important operations planning tasks require sales forecasts at multiple levels of aggregation. This leaves a firm with an organizational choice regarding its sales forecasting process. For example, family-level forecasts can be made directly based on family-level sales data, or instead in a bottom-up fashion where item-level forecasts are simply summed up to create aggregate forecasts. Similarly, item-level forecasts could be based directly on item-level sales data, or instead in a top-down fashion where a forecast is generated based on aggregate-level data and then apportioned to create lower-level forecasts. Our study investigates these forecasting processes through a behavioral lens. We identify three human judgment biases that affect forecasting performance: a propensity for "trembling hand" random errors, a tendency to systematically over- or underreact to demand signals, and persistent inability to detect and exploit the information contained in cross-item correlation structures.

FORECASTING THE SUCCESS OF POLICY IMPLEMENTATION STRATEGIES WITH STRUCTURED ANALOGIES, DELPHI AND INTERACTION GROUPS

Konstantinos Nikolopoulos, Bangor University / BEM- Bordeaux Management School
Co-Author(s): Vassileios Assimakopoulos, NTUA, Akrivi Litsa, National Technical University of Athens and Fotis Petropoulos, National Technical University of Athens

Policy Implementation Strategies are schemes designed by a government to help achieve policy targets via providing a range of incentives. Earlier research suggested that individual experts using Structured Analogies could successfully forecast the effectiveness of such schemes; building on this, the present study evaluates for the first time the use of structured analogies blended with group judgmental forecasting techniques, namely Delphi and Interaction groups. We use two policy implementations for the respective evaluation, both provided by the Special Secretariat for Digital Planning in Greece, a governmental body controlling budgets aiming to accelerate the use of ICT from companies and individuals. Empirical evidence from this study reveals an average improvement of 3% when using Structured Analogies, 20% for Delphi and more than 50% for Interaction Groups; thus our study supports the employment of group forecasting techniques in governmental planning.

THE USE OF POSITIVE AND NEGATIVE INFORMATION IN FORECASTING SALES PROMOTION UPLIFTS WITHIN AN FSS
Paul Goodwin, University of Bath
Co-Author(s): Dilek Önkal, Bilkent University and Robert Fildes, Lancaster University Centre for Forecasting

Field research on demand forecasting in companies suggests that people use information suggesting that statistical forecasts should be adjusted upwards (positive information) differently from information which implies that a reduction in the forecast should be made (negative information). This results in upwards adjustments in demand forecasts being over optimistic. This paper reports on an experiment which was designed to investigate whether this tendency is affected by the desirability of achieving high demand and/or rewards for accuracy when judgmental adjustments to statistical forecasts are made within a forecasting support system.

16:40 - 17:40 **HOW WELL CAN WE PREDICT RARE EVENTS?** Room Hyannis
Chairperson/Organizer: Don Harding, LaTrobe University

CAN MACROECONOMISTS FORECAST RISK? EVENT-BASED EVIDENCE FROM THE EURO AREA SPF
Geoff Kenny, European Central Bank
Co-Author(s): Kostka Kostka, ECB and Federico Masera, c/o Universidad Carlos III de Madrid, Economics Department, C/ Madrid 126, 28903 Getafe (Madrid), España

In this paper, we propose a framework to evaluate the probability assessments collected as part of the ECB Survey of Professional Forecasters (SPF). Our approach focuses on both direction-of-change predictions as well as the prediction of relatively extreme macroeconomic events located in the tails of the predictive densities. We exploit a large micro panel of individual forecasts and control for common shocks impacting on individual density forecast performance, thus helping to alleviate the low power which often plagues similar macroeconomic applications. For inflation and GDP growth, we find such surveys are genuinely informative about the likely direction of change in the forecast target variable at both short- and also more medium-term horizons. Regarding extreme events, the surveys are really only informative about high or low outcomes for GDP growth and at short-horizons of up to a year. In the case of inflation, the tails of the predictive densities appear to be much less informative. Lastly, we also identify some clear improvement in predictive performance achieved through the combination of individual expert replies. The latter provides some important justification for carrying out such expert surveys even if predictive performance at the individual level is less impressive.

DO LARGE ASSET PRICE DROPS FORESHADOW RECESSIONS?
John Bluedorn, IMF
Co-Author(s): Jorg Decressin, IMF and Marco Terrones, IMF
Large drops in asset prices are often associated with recessions. This paper examines the performance of large asset price drops as predictors of recessions in the G7 economies. The findings suggest that large asset price drops—particularly, equity prices—are useful predictors of recessions in these countries. To capture the effects of these price drops, the predictive power of non-linear functions of asset prices is explored. These non-linear

terms turn out to be statistically significant and robust to the inclusion of other financial variables (including the term-spread). Since recessions are comparatively rare events, standard estimators tend to underestimate the probability of a recession in finite samples. This paper corrects for this bias in a maximum likelihood framework using the solution proposed by Firth (1993).

HOW WELL DO GENERALIZED CATEGORICAL MODELS PERFORM IN PREDICTING RECESSIONS USING FINANCIAL DATA?

Don Harding, LaTrobe University

This paper evaluates the capacity of financial data to predict the beginning and end of United States recessions as identified by the NBER.
The financial data used includes stock returns, bond yields, interest rates and constructed measures of the volatility of asset prices. The non-financial data used includes, consumer prices, producer prices, the NAPM PMI composite index and its components, measures of labour market tightness and measures of household income and expenditure. The research questions studied in the paper are which financial variable are the best predictors of recessions and whether augmenting with data on real economic activity and prices helps improve prediction.
The framework used in this paper is an extension of the generalized categorical models developed in Harding and Pagan (2011). Specifically,
• The framework is extended to handle data at a monthly frequency.
• The minimum phase lengths imposed by the NBER procedures is estimated rather than imposed.
The best model for predicting the beginning and end of recessions selected. The horizon at which this model can reliably predict recessions is then evaluated.
References
Harding D., and A.R. Pagan (2011) "An Econometric Analysis of Some Models for Constructed Binary Time Series," Journal of Business & Economic Statistics, vol 29(1).

16:40 - 17:40 **JUDGMENTAL FORECASTING B** Room Maine
Chairperson: Edward Raupp, The University of Georgia (Tbilisi)

REGIME CHANGE DETECTION: TASK FACTORS AS DRIVERS OF JUDGMENTAL EFFECTIVENESS

Florian Federspiel, IE Business School
Co-Author(s): Lee Newman, IE University & IE Business School and Matthias Seifert, IE Business School

We examine the decision maker’s external environment, e.g. task ambiguity, as predictor of his judgmental effectiveness in detecting a regime change. The main task employed is one of regime-change detection over time. Two experimental lab studies form part of this study. Our first study looks at the effect of different task factors (diagnosticity, transition probability, and signal length) on judgmental accuracy, particularly with regards to over- and under-reaction. We have found evidence of systematic over- and under-reaction, on par with what is known as the system-neglect phenomenon (Massey & Wu 2005). Yet what has not received adequate attention is the effect of the

strength or extremeness of evidence. Signals that are highly representative of a change having occurred (e.g. a perception based on streaks) are likely to lead to systematic over-reaction. An added effect and/or interaction between the effect of the weight and the strength of evidence is not taken into account in the system-neglect hypothesis. Our second experimental study focuses on the effect of streaks as systematically leading to over-reaction in a regime change detection task.

ASSESSING THE IMPACT OF COLLECTIVE DELIBERATION ON PREDICTION ACCURACY - AN EXPERIMENTAL APPROACH

Ramona Schoder, Aalen University

Collective Forecasting methods that allow including the knowledge of different individuals to provide predictions and their prediction accuracy are topics that employ many researchers. In a review of scientific studies almost every study showed that obtaining accurate forecasts from collective forecasting methods is possible. Usually, studies compared the performance of different forecasting methods based on different mechanisms of information aggregation. Although these studies consider mechanisms that allow collective deliberation they usually do not focus on the impact of collective deliberation on prediction accuracy. Collective deliberation is one and in practice important way to pool information. In this paper the results of an experiment are presented that analyzed the influence of different degrees of collective deliberation on prediction accuracy. The experiment focussed on comparing several methods: “prediction without collective deliberation”, “prediction with collective deliberation”, and “group prediction”. In general, the conclusion is that there are no statistically significant differences in forecasting accuracy. In detail two findings are of interest. Firstly, all tested methods provided very accurate forecasts although group sizes ranged between 4 and 7 members. Secondly, collective deliberation and information exchange does not seem to influence prediction accuracy.

FORECASTING THE PROBABILITY OF WAR BETWEEN RUSSIA AND GEORGIA

Edward Raupp, The University of Georgia (Tbilisi)

In August 2008, military forces of the Russian Federation and separatist paramilitary groups of South Ossetia invaded the territory of Georgia. A ceasefire was facilitated by French President Nicolas Sarkozy after a week of fighting. In the following spring, speculation raged in Georgia about whether Russia would conduct another invasion in August of 2009. Little or no evidence was presented to support the speculation, but fears persisted. This study attempts to develop an evidence-based model to forecast the probability of another war between the two nations. Recognizing the difficulty of forecasting under conditions of such a high degree of uncertainty, the model combines multiple methods. Delphi uses a panel of foreign policy experts to assess monthly the probability of war, with statistics producing a time series. A second method selects relevant Russian press articles and assigns ratings based on a scoring rubric. Other methods, including scenario scripting, will be added. This is a long-term study, results of which will be of interest to and followed by government agencies, non-government organizations, academics, and others.

16:40 - 17:40 **MACROECONOMIC FORECASTING** Room Simmons
Chairperson/Organizer: Herman Stekler, George Washington University

THE 2009 RECESSION IN GERMANY: COULD IT BE SEEN?
Ullrich Heilemann, University of Leipzig
Co-Author(s): Susanne Schnorr-Backer, Federal Statistics Office

With a 5%-decline of real GDP the 2009 recession was the most severe in FRG's history. With an error of -5% for the forecast real GDP growth rate in autumn 2008 it also turned out to be the greatest debacle for FRG forecasters. While it is now clear that in 2008 the German economy experienced an extremely sudden, steep and rare fall from upswing into recession, the reasons for all this and the path into the crisis are still unclear. This paper examines forecasts by ten major institutions and the data that became available to them in the six months before the actual through of this cycle. The purpose here is, as in Fintzen/ Stekler (1999, 310), "to determine whether or not the data that were available in real time were clearly signaling a turn that was neither predicted in advance nor identified contemporaneously". The data examined include official statistics for Germany and for six major export countries absorbing more than 40% of its exports. In addition, we look at the signals given by major surveys and indicators. Their effects and that of the data are evaluated and confronted to the forecasts and their revisions.

PREDICTABILITY, PROFITABILITY, AND THE INTEREST RATE PROCESS
Roy Batchelor, Cass Business School, City University London

There is some much-cited evidence that the value to traders of financial forecasts is uncorrelated with the accuracy of the forecast. Much of the empirical evidence is, however, based on comparisons of small and eccentric sets of forecasts. Starting from standard assumptions about the process driving interest rates, this paper derives theoretical results for the correlation between root mean square error and profitability from simple trading strategies. These are compared with large and small sample estimates of correlations based on a panel of US interest rate forecasters, under different interest rate management regimes. In the full sample, we find moderately strong correlations between accuracy and profitability, close to their theoretically predicted values, though in a significant proportion of small samples perverse correlations can occur.

A NEW APPROACH FOR EVALUATING ECONOMIC FORECASTS
Herman Stekler, George Washington University
Co-Author(s): Warren Carnow, George Washington University and Tara Sinclair, George Washington University

We present a new approach for evaluating macroeconomic forecasts and then apply it to the Survey of Professional Forecasters (SPF) The traditional evaluation approach has been to examine the forecasts of each variable (GDP, inflation, unemployment, etc.) separately and individually. However, a macro forecast is intended to provide a holistic picture of the state of the economy. It is, therefore, necessary that the forecasts of all important variables should be evaluated jointly in a multivariate framework. We use the framework of Sinclair and Stekler forthcoming) that analyzed two sets of estimates of the growth rates of GDP components as the difference between the two vectors. The Mahalanobis difference was the accuracy measure. In our analysis, one vector will be the SPF forecasts that refer to a particular point in time; the other will be the actual outcomes for those variables.

16:40 - 17:40 **VOLATILITY** Room Regis
Chairperson: Van Le, The University of Newcastle

DO LOCAL AND GLOBAL MACROECONOMIC VARIABLES HELP FORECAST VOLATILITY OF PAKISTANI STOCK MARKET?
Javed Iqbal, Karachi University

Emerging markets are characterized by higher volatility and higher associated returns as compared to developed markets. The excessive volatility in emerging markets is often considered a result of inherent instability and unpredictability of country's political, institutional and macroeconomic environment. Increasing globalization and integration of financial markets imply that volatility of emerging markets may also be affected by global macroeconomic and business conditions. We investigate this issue for an emerging market namely Pakistan. An important objective of this research is to provide empirical evidence on whether local and global macroeconomic variables help forecast volatility of this market over and above the GARCH models which predict volatility on the basis of past shocks and past accumulated variance. Using monthly data over the post liberalization period from 1990 to 2010 we show that local variables have higher explanatory power to affect Pakistani stock market volatility compared to the global information variables.

PREDICTABILITY OF PRICES IN A FINANCIAL MARKET: MODELING INCREASED VOLATILITY AND HERDING BEHAVIOR TO GENERATE PROFITS IN A SPORTS BETTING MARKET
Johnnie Johnson, Centre for Risk Research, University of Southampton
Co-Author(s): David McDonald, Centre for Risk Research, University of Southampton and Ming Chien Sung, Centre for Risk Research, University of Southampton

Increased price volatility and herding are important factors which may affect the efficiency of financial markets. However, empirical evidence concerning these phenomena in financial markets and the laboratory is mixed. Betting markets provide a valuable setting to study market efficiency, with a number of advantages over other types of financial market and the laboratory. Using conditional logit analysis on a dataset of 6058 horse races in the UK, we find that increased volatility results in greater efficiency. We find evidence of herding behavior by bettors, although only in the later, more intense, stages of the market. We demonstrate that this results in an economically significant inefficiency; betting strategies designed to trade against the herd show substantial positive returns. Our findings contribute to the broad field of research on behavioral biases in financial markets.

FORECASTING THE SMILE DYNAMICS

Van Le, The University of Newcastle
Co-Author(s): Ralf Zurbrugg, The University of Adelaide

Practitioners have long tried to exploit the predictability of the implied volatility smile. Motivated by the recent development of the extant literature focusing on market-based option pricing arguments, this paper proposes the introduction of trading volume into the VAR structure to improve forecasts of the smile dynamics. We found that our augmented VAR-volume model produced high quality forecasts of the smile surface and explained relatively well its dynamic changes over time. In particular, ex-ante evidence suggests that the incorporation of trading volume leads to an outperformance over other alternative forecast approaches and yields statistically significant trading profit. This result is robust to a variety of perturbations of the sampling period and offers scope for investors to more accurately predict option implied volatility (price) in the future.

WEDNESDAY JUNE 27 2012

08:30 - 09:30 **ARNOLD ZELLNER KEYNOTE ADDRESS** Room Salon G
Chairperson: Antonio Garcia-Ferrer, UAM

FORECASTING WITH MANY PREDICTORS: WHAT HAVE WE LEARNED?

James H Stock, Harvard University

The past decade has seen tremendous methodological progress and a great deal of empirical work on forecasting and nowcasting with many predictors. This paper reviews that work with a focus on practical lessons for forecasting with many predictors. Dynamic factor models are compared with other many-predictor schemes available in the statistics literature. I pay particular attention to the extent to which dynamic factor models provide robust platforms for forecasting, in the sense of producing forecasts that are less prone to structural breaks, than alternative schemes. These issues are examined empirically with an investigation of the stability of dynamic factor models over the 2007-2007 recession and subsequent slow expansion in the United States.

09:40 - 10:25 **SCENARIOS AND FORESIGHT 1** Room Wellesley
Chairperson: Roy Pearson, Mason School of Business, The College of William and Mary
Organizer: Len Tashman, Editor of Foresight

ANTICIPATING SHIFTS IN THE OPERATING ENVIRONMENT, PRIORITIZING OPPORTUNITIES, AND IMPLEMENTING FUTURE-WISE SOLUTIONS
Adam Gordon, Adaptive Leadership Foresight UK

Scenario Planning is a qualitative approach to building foresight in situations where future uncertainty levels are medium-high -- situations beyond the credible reach of all forms of quantitative, predictive, or extrapolative forecasting. Since the scenario approach to foresight first came to general management and academic prominence in the mid-1980s, the method has been reworked and refined, mostly via practitioner experimentation. In this presentation, Adam Gordon, author of "Future Savvy" (Amacom, 2009) and "Management By Looking Ahead (blogs.forbes.com) will present his new recent research in the field, showing via case studies where the unassailable value of scenario process remains for planners, while also describing how and where the method overreaches.

09:40 - 10:25 **CONSUMER CHOICE** Room Tufts
Chairperson: Chul Kim, KAIST

CONSUMER CHOICE FORECAST WITH CONSIDERATION SET
Kyungmo Oh, KAIST College of Business
Co-Author(s): Duk Bin Jun, KAIST College of Business and Byungho Park, KAIST College of Business

In the consumer choice model, we can explain the consumers' behavior through demographic variables. However, unbeknownst to the consumer, the first impression he or she gets of a product greatly influences his or her choice. This is particularly true in the case of experience goods.

Therefore, demographic variables can explain only a part of the consumer's choice. Moreover, the consumer goes through a process of narrowing down a number of alternatives to one final choice.

We conducted our experiment in the following two stages. At the first stage, we presented 24 movie posters in consecutive order and observed the subject's rating and physiological response. Then, we asked the subjects to make a consideration set of movies that interested them. At the second stage, we presented all 24 posters at once and asked them again to make a decision of choosing one movie that they would like to see.

Through this experiment, we examined how the consumer's characteristics influence the choice, and how the alternatives in his or her consideration set are chosen. Since the choice model illustrates the probability of a consumer's choice, the aggregate choice probability means the market share forecast.

FORECASTING CONSUMER DEMAND: THE ROLE OF STICKER SHOCK ON QUANTITY AND VARIETY

Chul Kim, KAIST
Co-Author(s): Duk Bin Jun, KAIST

The effect of sticker shock, price difference between reference price and shelf price, is crucial in forecasting consumer demand. In marketing literature, several papers have modeled the impact of reference prices on brand choice via the sticker shock formulation. However, the effect of sticker shock on brand choice might be controversial. The sticker shock parameters were significant in some studies without heterogeneity in price response, whereas the sticker shock parameters were insignificant in other studies with the heterogeneity. If so, does the sticker shock effect exist or not?
Insignificant sticker shock parameters in prior studies imply that sticker shock could not affect purchase incidence. There could be still high possibility that sticker shock could affect purchase quantity. Also, it is feasible that sticker shock parameter could be underestimated within multinomial incidence outcomes which have been used for prior studies.
We investigated the effect of sticker shock on both incidence and quantity by using multivariate quantity outcomes in three categories. We found that the effect of sticker shock on quantity was significant in all categories. Also, we found that the sticker shock effect on incidence within multinomial choice outcomes was insignificant, whereas the effect on incidence within multivariate choice outcomes was significant in yogurt category.

09:40 - 10:25 **DEMOGRAPHIC FORECASTING** Room Yarmouth
Chairperson: Øyvind Langsrud, Statistics Norway

FERTILITY LEVEL, CHANGING TRENDS AND POSSIBLE RELAXATION OF THE ONE-CHILD POLICY IN CHINA

Bojuan Zhao, Tianjin Univerisity of Finance and Economics
Co-Author(s): Zining Bao, Tianjin Univerisity of Finance and Economics and Xiangliang Liang, Tianjin Univerisity of Finance and Economics

Age-specific fertility rates in China decrease from 1990 to 2000. From 2000 onward, these rates for first-born babies increase everywhere and at all ages except for women under 27 in cities, under 26 in towns, and under 25 in counties (rural villages, excluding towns) because young people marry late. For second and above babies, fertility rates have also increased, exceeding the limits set by the one-child policy. Comparisons of the predicted age-specific rates for 2009 and the observed rates from an annual survey of the 0.1% of the entire population in 2009 validate the conclusions on the assessments of the fertility level and the changing trends. Based on the estimated age-specific fertility rates over years and current women's age distribution, China is supposed to be experiencing a peak or peaks of new born babies, and it is not a good timing to relax the one-child policy right now.

MORTALITY FORECASTING BY GENERALIZED LEE-CARTER MODELING: COMBINING MEN AND WOMEN INTO A SINGLE DATA MATRIX.*f*

Øyvind Langsrud, Statistics Norway
Co-Author(s): Dinh Quang Pham, Statistics Norway

Mortality forecasting is commonly based on methods related to principal component analysis and the Lee-Carter method. The modeling is usually done separately for each sex. Another approach is the product-ratio method which models products (between sexes) and ratios separately. The advantage is that the product and the ratio behave roughly independently of each other. This paper suggests a third approach. We combine the 101 rates for men and the 101 rates for women into one matrix with 202 rates. A single decomposition is conducted based on this combined data matrix. The three approaches are compared by using generalized Lee-Carter modeling of Norwegian mortality data. Especially, we illustrate how the out-of-sample forecasts behave when varying the number of components.

09:40 - 10:25 **ECONOMETRIC FORECASTING A** Room New Hampshire

Chairperson/Organizer: Kajal Lahiri, University at Albany

REAL EXPECTATIONS: REPLACING RATIONAL EXPECTATIONS WITH REALISTIC EXPECTATIONS MEASURES IN A DYNAMIC MACRO MODEL

Jeffrey Fuhrer, Federal Reserve Bank of Boston

For some years, macroeconomists have converged on DSGE models with rational expectations as the standard for macroeconomic modeling. In the aftermath of the Great Recession, authors are now proposing additions to these models that may influences policies to address financial instability. In almost every case, expectations are assumed to be rational, in the sense that all agents' expectations are assumed to equal the mathematical expectations implied by the DSGE model. And yet a body of work suggests that simple DSGE models with rational expectations demonstrate significant counterfactual implications. This paper investigates the extent to which a change in the expectations assumption can substitute many recent alternative extensions, leaving a model that retains much of the underlying structures that have been developed in recent years, but without some of the bells and whistles that have allowed the models to meet formidable empirical challenges. In particular, the paper develops evidence that the systematic use of survey expectations—one way of using measured, rather than assumed expectations—offers a number of advantages over the rational expectations models. Identification of key parameters is improved, and the need for modeling epicycles such as correlated shocks and pseudo-structural features that amount to adding lagged endogenous variables to the model is obviated. The empirical success of the survey-based DSGE model is encouraging.

UNEMPLOYMENT FORECASTS: CROSS-COUNTRY ASSESSMENT AND BELIEF IN OKUN'S LAW
Prakash Loungani, International Monetary Fund
Co-Author(s): Laurence Ball, Johns Hopkins University and Joao Jalles, University of Aberdeen

This paper provides a full characterization of unemployment rate forecasts using Consensus Economics for a sample of 9 advanced countries between 1989 and 2009. Moreover, it also aims to uncover the private sector's beliefs about Okun's Law. We find evidence for biasedness, inefficiency or information rigidity and lack of accuracy of unemployment rate forecasts and the distribution of projection errors appears to be slightly twisted toward over-prediction. Finally our results suggest that private sector's forecasters seem to believe in Okun's Law—a significant negative relationship between the expected change in unemployment and the expected growth rate of real GDP—and belief in the relationship has become stronger over time.

09:40 - 10:25 **ENERGY AND ENVIRONMENT** Room Simmons
Chairperson: Yongfu Huang, UNU-WIDER

FORECASTING CARBON FUTURES VOLATILITY: THE PREDICTING POWER OF GARCH MODELS WITH ENERGY VOLATILITIES
Hangjun Cho, KAIST Business School
Co-Author(s): Suk Joon Byun, KAIST Business School

This study examines the volatility forecast abilities of two approaches which are GARCH-type models using carbon futures prices and an implied volatility from carbon options prices. Based on the results, we document that GARCH-type models perform better than an implied volatility. This result suggests that carbon options have little information about carbon futures due to their low trading volume. We also investigate whether the volatilities of energy markets, i.e. Brent oil, coal, natural gas, and electricity, forecast following day's carbon futures volatility. According to the results, we suggest that Brent oil and natural gas may be used to forecast the carbon futures volatility.

FORECASTING CHINA'S CARBON INTENSITY WITH A DYNAMIC SPATIAL PANEL DATA MODEL
Yongfu Huang, UNU-WIDER

This paper carries out a multi-step forecasting for the annual carbon intensity for each of the 31 provinces in mainland China over the period from 2000 to 2008. It considers the spatial GMM estimator in a spatial dynamic model, which includes a spatial lag together with spatially correlated disturbances. It compares the model predictions using the spatial GMM estimator and using OLS, Within Group and GMM, which take no account of the spatial structure of the disturbances. The main empirical findings of this paper provide significant insights for China's governments, central and regional, in terms of their commitments to reduce carbon intensity by 2020.

09:40 - 10:25 **FORECASTING MODELS FOR POLICY ANALYSIS A** Room Massachusetts
Chairperson/Organizer: Gianni Amisano, European Central Bank

DSGE MODEL-BASED FORECASTING
Marco Del Negro, Federal Reserve Bank of New York
Co-Author(s): Frank Schorfheide, University of Pennsylvania

Dynamic stochastic general equilibrium (DSGE) models use modern macroeconomic theory to explain and predict comovements of aggregate time series over the business cycle and to perform policy analysis. We explain how to use DSGE models for all three purposes—forecasting, story telling, and policy experiments—and review their forecasting record. We also provide our own real-time assessment of the forecasting performance of the Smets and Wouters (2007) model data up to 2011, compare it with Blue Chip and Greenbook forecasts, and show how it changes as we augment the standard set of observables with external information from surveys (nowcasts, interest rate forecasts, and expectations for long-run inflation and output growth). We explore methods of generating forecasts in the presence of a zero-lower-bound constraint on nominal interest rates and conditional on counterfactual interest rate paths. Finally, we perform a postmortem of DSGE model forecasts of the Great Recession and show that forecasts from a version of the Smets-Wouters model augmented by financial frictions, and using spreads as an observable, compare well with Blue Chip forecasts.

FORECAST COMBINATION AND SHORT TERM FORECASTING: AN APPLICATION TO CANADA
Eleonora Granziera, Bank of Canada

This paper illustrates the forecast combination exercise conducted over several time series models used by the Bank of Canada for short term forecasting of Canadian GDP. The exercise takes into account the issue of release lags of data so the analysis distinguishes between back-casting, now-casting and forecasting up to two quarters ahead. Forecasts are produced recursively and evaluated over the sample 1999Q4 to 2011Q2. Combined forecasts are constructed using weights computed using different combination techniques. Our results indicate that pooling of forecasts improves upon both the single best performing model and simple benchmarks. Also, the simple average combination is outperformed by other combination methods that take into account the relative forecasting performance of the models.

09:40 - 10:25 **PORTFOLIO MONITORING** Room Maine
Chairperson: Bruno Dore Rodrigues, The University of Sydney

INVESTMENT TIMING USING HIGH FREQUENCY TRADING DATA
Bruno Dore Rodrigues, The University of Sydney
Co-Author(s): Max Stevenson, The University of Sydney

An innovative market timing approach is proposed in this paper to capture information from intraday trading and to guide portfolio investments. It is based on the application of the ACD model, jointly with market timing rules, to generate trading recommendations. The information content of each trade is analysed in the search for trading behaviour consistent with the use of privileged information before an event such as a takeover announcement. A forecast range timing strategy is shown to be successful in predicting market trends and providing a method for reducing risk without sacrificing return. The active management of a portfolio using this method is especially efficient in protecting investors from periods of negative returns, along with signalling investment in stocks before run-ups in prices. Based on historical trade and quote data, computational results are reported for 78 companies listed on the Australian Stock Exchange (ASX) over three different periods. The results indicate that the proposed forecast range strategy produces higher average returns than the benchmark buy-and-hold strategy, while reducing risk by holding stock during a fraction of the period.

BLOCK-BOOTSTRAP TRANSITION PROBABILITIES FOR SHORT-TERM CORRELATION FORECASTING
Goncalo Martins Ferreira, EDP - Energias de Portugal

Correlation between risk factors affecting business units in multinational companies constitutes a major risk management tool to evaluate natural hedging opportunities. Being able to accurately predict return correlations is, therefore, one of the major challenges facing practitioners. A semiparametric forecasting approach is here presented. Correlation is assumed to follow a multi-regime data generating process where transition probabilities follow n-step Markov processes dependent on the stochastic properties of each variable. The boundaries of each regime are empirically defined by the joint standardized distribution (due to their fine properties, z-scores fit especially well in correlation analyses). A block-bootstrap resampling setting is carried out in order to estimate intra-regime correlations as well as transition probabilities for n-step horizons. Conditional on current observed regime it is possible to forecast future correlation based on expected correlation bootstrap distributions that are estimated for each time horizon. This approach is applied to commodity prices and currency exchange rates using monthly data. Backtesting exercises show reliable results in forecasting 3-year return correlations.

09:40 - 10:25 **TAIL FORECASTING** Room Hyannis
Chairperson: Jose Faias, UCP Catolica Lisbon SBE

ESTIMATING THE TAIL SHAPE PARAMETER FROM OPTION PRICES
Kam Hamidieh, Cal State University, Fullerton

In this paper, a method to estimate the tail shape parameter of the risk neutral density from option prices is developed. Closed form pricing formulas for out-of-the-money European style options are derived. The pricing formulas satisfy many well known model-free no-arbitrage properties for the options. The focus is only on the tails of the risk neutral density and not on the entire body of the density as many works have already done this. The method is quite general, and applies to a large class of risk neutral densities. Our method can be used without interpolating the implied volatility, or even the knowledge of the current index value or the dividend yield or the risk free rate. This is in contrast to every other method that attempts to estimate the risk neutral density. A case study using S&P 500 Index options is given. In particular, the estimation of the tail shape of S&P 500 index just prior to the market turmoil of the September 2008 shows a thickening of the left tail but a thinning in the midst of the turmoil.

ARE THE TAILS DIFFERENT FROM THE BODY? AN INTERNATIONAL APPROACH TO STOCK RETURNS TAIL DEPENDENCE
Jose Faias, UCP Catolica Lisbon SBE
Co-Author(s): ,

In recent years there has been an increasing interest in modeling dependence in heavy tail phenomena such as the latest turbulence episodes in financial markets. The evidence of asymptotic independence in the financial data has led to the need of rethinking risk modeling and inference tools for multivariate extremes. One of the most well-known measures of the degree of association between random variables is Pearson correlation, but it suffers from some awkward drawbacks being ineffective for assessing dependence in the tails. In this paper we measure extremal correlation in international equity markets. Our analysis offers a new perspective into the dynamics governing asset return comovements during periods of stress at the cross-country and cross-sectoral levels. We also successfully predict the stock market using this type of measures.

09:40 - 10:25 **APPLICATIONS of FORECASTING** Room Boston Univ
Chairperson: Swami Bonu, University of Botswana

FORECASTING SMOKING PREVALENCE IN KOREAN MEN. Sung-il Cho, Seoul National University.
Male smoking prevalence in Korea is among the highest few of those in OECD member countries, with 48% in 2010. To reduce the smoking and related deaths, Korean government set a national goal to bring it down below 30% by 2020. This daunting task requires strong policy implementation including increase of tobacco tax and expanding free treatment of nicotine dependence. Since these measures involve substantial budget issues, scientific evidence is essential to support the policies. We developed a simulation model, Korea SimSmoke, to forecast smoking prevalence for various policy scenarios. SimSmoke is a simulation model of the effect of tobacco control policies over time on smoking initiation and cessation. After validating the

model against smoking prevalence, we used it to determine the Korean policies' effect on smoking prevalence. The results show that in order to meet the 2020 goal, a minimum of $2 tax increase per pack of cigarettes is obligatory, even if all non-tax control measures can be abruptly strengthened to the full possible extent. Assuming that non-tax measures will be implemented to less than full extent, tobacco tax raised by $5 per pack of cigarettes is predicted to decrease male smoking below 29% by 2020.

FORECASTING MICRO-HEALTH INSURANCE: A CASE STUDY, Swami Bonu, University of Botswana

Catastrophic health care expenditures lead to intergenerational regression of households into poverty, and push poor households deeper into poverty. Micro-health insurance (MHI) can reduce catastrophic health care risks of the poor by providing affordable health insurance in developing and transitional nations such as Botswana. However, the health costs are increasing due to prevailing HIV/AIDS and chronic diseases and poor are unable to avail the health care due cost and the limiting coverage. The study investigates the MHI schemes in Botswana including Itekanele Medic Aid Scheme using cost benefit and affordability analysis. In this paper population data is classified with income earning capacity and linked with the MHI currently availed. The outcome is compared with the government policies, projections and commitments for provision of health schemes. It is seen there is a bright future for MHI development in the near future and by 2020, it is forecasted that MHI in Botswana will be cover by 90% of the poor.

10:50 - 11:35 **SCENARIOS AND FORESIGHT 2** Room Wellesley
Chairperson: Roy Pearson, The College of William and Mary
Organizer: Len Tashman, Editor of Foresight

USING EXTERNAL (MOSTLY FREE) RESOURCES FOR MEDIUM- TO LONG-RANGE FORECASTING
Roy Pearson, Mason School of Business, The College of William and Mary

Strategic foresight is a way of thinking that enhances our understanding of plausible future strategic operating environments. As the planning horizon lengthens to five, ten, fifteen or more years, such foresight becomes more global and multi-dimensional, encompassing the interaction of demographic, economic, government, environmental, social, and technological forces and shifts. The internet offers a few hundred future-focused sites with baseline forecasts, assessments of signals and trends, exploration of the dimensions of uncertainty, and scenarios centered on a wide variety of issues and horizons. Expand the scope of your vision and sharpen your foresight skills by accessing such internet sites to see a kaleidoscope of views about the future, plus how they are developed and communicated. This session will be an annotated journey through a sampling of foresight approaches and outcomes offered on the internet.

10:50 - 11:35 **DEMOGRAPHIC UNCERTAINTY IN MACROECONOMIC MODELING 1** Room Yarmouth
Chairperson/Organizer: Juha Alho, University of Eastern Finland

FISCAL SUSTAINABILITY AND POLICY RULES UNDER CHANGING DEMOGRAPHIC FORECASTS
Jukka Lassila, ETLA
Co-Author(s): Tarmo Valkonen, ETLA
All practical evaluations of fiscal sustainability that include the effects of population ageing must utilize demographic forecasts. It is well known that such forecasts are uncertain, and that has been taken into account in some studies by using stochastic population projections jointly with economic models. We develop this approach further by introducing regular demographic forecast revisions that are embedded in stochastic population projections. This allows us to separate systematically, in each demographic outcome and under different policy rules, the expected and the actualized effects of population ageing on public finances. We apply this to Finland, show that the likelihood of sustainability risks is significant, and that it would be wise to consider policies that reduce the likelihood of getting highly indebted. Furthermore, although demographic forecasts are uncertain, they seem to contain enough information to be useful in forward-looking policy rules.

CHANGING HOUSEHOLD PATTERNS IN DENMARK: SOME FISCAL AND MACROECONOMIC IMPLICATIONS FOR THE WELFARE STATE
Svend E. Hougaard Jensen, Copenhagen Business School
Co-Author(s): Rasmus Hoejbjerg Jacobsen, Copenhagen Business School
This paper first considers the magnitudes of projected changes in future household structures in Denmark. Focusing on components of welfare services with noticeable differences in unit costs between individuals living

as singles and couples, the paper next offers an assessment of what the projected demographic changes may imply for public expenditures and the sustainability of fiscal policy. Finally, using a dynamic general equilibrium model with overlapping generations and heterogeneous households, the paper investigates whether changes in household structures may have wider macroeconomic effects.

10:50 - 11:35 **ECONOMETRIC FORECASTING B** Room New Hampshire
Chairperson/Organizer: Kajal Lahiri, University at Albany

ON THE ESTIMATION OF FORECASTER LOSS FUNCTION USING DENSITY FORECASTS
Fushang Liu, Massachusetts Department of Revenue
Co-Author(s): Kajal Lahiri, University at Albany:SUNY

Using density forecasts, we estimate asymmetric loss function parameters without assuming rationality. We compared three methods: a GMM method that does not utilize any information from the density forecasts; traditional unbiasedness regression augmented by forecast uncertainty obtained from density forecasts, and a new method that combines the point forecasts and the entire density forecasts. These three methods are applied to forecasts obtained from the Survey of Professional Forecasters (SPF) for annual real output growth and inflation. We find that the use of information from the density forecasts produces more plausible estimates of loss function parameters. We also investigate Granger's conjecture that the asymmetry in loss functions may depend on certain state variables and exogenous factors, and find that it depends on forecast horizons and the state of current macroeconomic conditions as measured by economic growth and other coincident indexes.

ECONOMETRIC MODELS AND LEADING INDICATORS: THE CHOICE OF OIL PRICE FORECASTING MODEL
Alexander Apokin, Center for Macroeconomic Analysis and Forecasting

In this paper we try to compare oil price forecasts derived from different economic, industry and statistical assumptions.
Oil price is among the least predictable, while the oil demand and supply are among the most stable of all commodities. There is significant amount of literature on oil price forecasting (Frey et al (2010)), but a mainstream approach in this field still has not emerged.
We construct three types of estimators for oil price based on:
• Time series analysis (canonical Box-Jenkins ARIMA approach)
• Efficient markets theory (as per Fama (1965), assumes semi-strong information efficiency of the oil market, uses no arbitrage condition between spot and futures prices, based on Abosedra (2005))
• Structural macroeconomic approach (based on Kaufmann et al (2007), assumes weak information efficiency of the oil market)
In addition, we construct leading indicators for sharp changes in oil price based on two approaches: binary choice econometric models and modified Kaminsky (1995) methodology. We compare forecasting properties of binary indicators to model forecasts and IMF WEO spring and autumn oil price projections.
We conclude that IMF forecasts have larger systemic bias than out-of-sample oil price forecasts from structural models but the former generally have less variance. We show that leading indicators are superior both to point oil price forecasts and IMF forecasts in predicting sharp oil price changes in subsequent two quarters.

10:50 - 11:35 **ELECTRICITY PRICES B** Room Hyannis
Chairperson: Kees Bouwman, Erasmus University Rotterdam

A HYBRID ELECTRICITY PRICE FORECASTING MODEL FOR THE FINNISH ELECTRICITY SPOT MARKET
Sergey Voronin, Lappeenranta University of Technology
Co-Author(s): Jarmo Partanen, Lappeenranta University of Technology

A hybrid electricity price forecasting model for the Finnish electricity spot market is proposed in this paper. The daily electricity price time series is analyzed in two layers – normal behavior and spiky behavior. Two different data preprocessing techniques are applied to handle trend and seasonality in the time series. ARMA-based model is used to catch the linear relationship between the normal range price series and the explanatory variable, GARCH model is used to unveil the heteroscedastic character of residuals, and a neural network is applied to combine predictions from ARMA-based and GARCH models to produce a final normal range price forecast. The probability of a price spike occurrence and the value of a price spike are produced by a Gaussian Mixture model and k-NN model respectively. Forecasts of normal range price and price spikes are generated to form an overall price forecast up to one week-ahead. The results show that hybridization of the normal range price and price spikes forecasts may provide extensive and valuable information for electricity market participants.

DYNAMIC FACTOR MODEL FOR ELECTRICITY PRICE
MariaElsa Correal, Universidad de Los Andes
Co-Author(s): Stevenson Bolivar, Universidad de Los Andes

We propose a dynamic factor model for electricity spot prices and apply it to the colombian electricity market. Transaction of the electricity prices are done once a day for every hour of the day given rise to 24 market price. A dynamic factor model is suitable because it reduces the dimension of the system and also reveals common components. We identify two common factors, reducing the 24 dimension vector to a two dimensional vector. The first factor is a weighted average of each hour price; the second one is a contrast of the highest hours demand with the hours of lowest demand. The estimation procedure is done via the EM algorithm and the Kalman filter applied to a state space representation of the vector model.

10:50 - 11:35 **FORECASTING IN FINANCE MARKETS C** Room Boston Univ
Chairperson: Michael Haley, Point Park University

TIMING ASSET MARKET PEAKS: THE ROLE OF THE LIQUIDITY RISK CYCLE OF THE BANKING SYSTEM
Patrick Weber, EBS Business School

Recent financial crisis showed how the unfolding of liquidity risks of financial intermediaries spilled over to asset markets, contributing to asset price deteriorations and the triggering of liquidity spirals. This paper derives and tests a financial fragility condition for predicting asset price peaks on a real-time basis, by combining the term spread and the aggregate funding liquidity risks of the banking system into a simple binary fragility indicator. The main empirical result of this paper is that the fragility condition predicted all major equity market peaks in Germany during the time period 1973 to 2010, including the subprime crisis of 2007, the New Economy Bubble of 2000, and the 1987 stock market crash. The average lead time of the indicator is 2.9 months. About 80% of the declines were later on associated with significant declines in Industrial Production.

WHAT MONETARY POLICY PREVENTS FINANCIAL CHAOS?
Michael Haley, Point Park University

Monetary policy can cause individuals to chaotically speculate about the direction of financial markets that destabilizes the whole economy. Is it possible to make more reliable forecasts, based on a policy that helps all of us, including central banks, correct our mistakes? “If I had a simple answer, I would be spreading it around the world,” said Professor Sims after winning the 2011 Nobel Prize in Macroeconomics (Associated Press, October 11, 2011). This paper proposes an interdisciplinary solution that applies chaos theory to find a monetary policy that can prevent the next financial crisis. Central banks should flatten the “real yield curve” for government bonds, making the stock market more efficient by reducing arbitrage. Instead central banks are betting on the protection of the Basel III rules, requiring more bank capital to prevent the next crisis. Having adequate bank reserves can not solve the problem of imprudent speculation, financed by cheap money provided by central banks to stimulate economic growth.

10:50 - 11:35 **FORECASTING MODELS FOR POLICY ANALYSIS B** Room Massachusetts
Chairperson/Organizer: Gianni Amisano, European Central Bank

LARGE MODELS OR MODEL AVERAGING? FORECASTING WITH BAYESIAN VARS
Ken Beauchemin, Federal Reserve Bank of Minneapolis

Vector autoregression (VAR) models have long been the workhorse of macro-economic forecasting. Because they are richly parameterized, and that macro-economic data samples are limited in size, forecast degradation due to overfitting has always been a main concern with these models. This issue has typically been

addressed by sharply restricting the number of variables in the system and introducing Bayesian prior information–most commonly a version of the "Minnesota" prior introduced by Doan, Litterman, and Sims (1984). Alternatively, artificially small systems introduce forecast error through the channel of model mis-specification.
Recently, Banbura, Giannone, Reichlin (2010) reverse the conventional wisdom and show that large Bayesian VAR models–some that contain more than one hundered variables–outperform small BVARs in forecasting a small subset of variables most relevant to the monetary policymaker, provided of course that the priors of the larger models are sufficiently tight. They use the natural conjugate version of the Minnesota prior (Sims and Zha, 1998). They also show that large BVARs perform well against the factor-augmented VAR (or FAVAR) models. Koop (2010) confirms these results and also shows that the large Bayesian VARs compare favorably to more complicated and computationally intensive prior specifications.
Another strand of research confronts misspecification-based forecast error by combining forecasts produced by separate models into a single averaged forecast. This approach recognizes that there are many mis-specified models, but that each may also have desirable forecasting properties. Both the large Bayesian VAR and Bayesian model averaging methods address the risk of forecast errors due to overfitting and to misspecification, but with different tradeoffs.
This paper compares the forecasting performance of large Bayesian VARs versus those produced by Bayesian averaged forecasts from a specific sub-set of small Bayesian VARs. Another, and complementary, objective of the paper is to evaluate the forecasts produced by two conceptually distinct methods of Bayesian forecast combination. The more common of the two applies model weights based on the individual model marginal likelihoods. Because that method chooses weights according to each model's ability to fit the data sample, it raises the spectre of overfitting. (Eklund and Karlsson,2005). Additionally, large models are likely to contain many variables that are not of immediate interest to the practitioner, but nevertheless impact the model weights (Andersson and Karlsson, 2007). To address these potential drawbacks, I also weight the individual models using marginal densities from their respective predictive likelihoods.
The preliminary results can be summarized as follows. In general, both the marginal likelihood and predictive likelihood based averaging approaches produce forecasts superior to those produced by the large BVAR, with the predictive density approach outperforming the more traditional marginal likelihood-based averages. These results are especially valid for the inflation forecasts and are robust to forecast horizons extending to eight quarters.

PREDICTION WITH SEVERAL MACROMODELS

Gianni Amisano, European Central Bank
Co-Author(s): John Geweke, University of Technology Sydney

There are several relevant layers of uncertainty that characterise econometric models routinely used for policy making. First and foremost, there is intrinsic uncertainty about the future conditional on a model and parameters. Then there is extrinsic uncertainty about model parameters conditional on a model. Then there is uncertainty about models conditional on a set of models. In addition there is unconditional uncertainty, when all models considered are false. In this paper we incorporate all four levels of uncertainty and we assess the improvements in the quality of prediction that we get by doing so. We provide a practical example based on the joint combination of a DSGE model, a Bayesian VAR and a dynamic factor model for a set of US macroeconomic time series. In our paper

we find that :
1.Taking into consideration parameter uncertainty is most relevant in periods of unusual data.
2. A pool with equal weights provides predictions of superior quality with respect to prediction obtained with individual models.
3. We introduce a measure of value of each of the models being combined that can be decomposed across sub-periods and this measure provides important indication regarding the usefulness of the individual models.

10:50 - 11:35 **FORECASTING SOFTWARE PROVIDERS A** Room Simmons
Chairperson/Organizer: Stephan Kolassa, SAP AG

HOW TO IMPROVE LARGE-SCALE FORECASTING PROCESSES
Eric Stellwagen, Business Forecast Systems, Inc.

Forecasting thousands or tens of thousands of SKUs on an on-going basis is fundamentally different than trying to accurately model individual time series. In an environment where the sheer volume of forecasts precludes modeling and reviewing each SKU individually, an organization needs to take a bigger-picture longer-term approach to improving its forecasting process. In this presentation, we'll discuss how a successful large-scale forecasting process typically evolves by exploring: the role of automatic time series methods; how to customize approaches for different classes of items; how to monitor forecast accuracy to guide process change and how to use exception reports and filtering to better allocate human resources. The presentation will illustrate the benefits of these approaches using an actual corporate data set and the Forecast Pro TRAC software.

INTRODUCTION TO SAS FORECAST STUDIO
Michael Leonard, SAS Institute

Given the scale of many forecasting problems, manually customizing many statistical models may not be feasible. SAS® Forecast Studio facilitates and speeds the statistical forecasting process by providing a convenient, user-friendly interface to the large-scale automatic forecasting, model building, and time series exploration capabilities available in the SAS System. It addresses the needs of novice forecasters by being largely automated, yet still meets the needs of more experienced analysts by providing layers of sophistication that can be accessed as needed.

10:50 - 11:35 **ICT/TELECOMMUNICATIONS A** Room Tufts
Chairperson/Organizer: Gary Madden, Curtin University

FORECASTING MOBILE SOCIAL NETWORKING AND TESTING CROSS-COUNTRY HETEROGENEITY ASSUMPTION
Mohsen Hamoudia, Orange-France Telecom Group
Co-Author(s): Miriam Scaglione, Institute of Tourism, University of Applied Sciences Valais, Switzerland,

Mobile Social Networking (MSN) is enjoying strong growth around the world and have become a well-established communication channel between people and communities. It is driven by smartphones and mobile broadband and some important social changes.

One key question is how is the MSN market likely to evolve in the coming years and which future developments are needed in terms of network capacity, new devices, new applications and contents. Forecasts will help all players in the field (operators, governments, devices and applications and content providers, …) to manage and adapt resources to meet users expectations. However, adoption varies widely by country as each one show different Social Networking diffusion patterns due to the population profile, economic development, education, devices market, provider's offerings and pricing, infrastructure development, disposable income.
This research uses data of adoption of Mobile Social Networking (MSN) of some selected countries and its aim is threefold. Firstly, to show evidences of the heterogeneity across countries in the propensity to adopt using the Gamma/shifted Gompertz (G/SG) (Bemmaor and Lee, 2002; Van den Bulte & Stremersch, 2004). Second, to compare the accuracy of estimations using Bass, Gompertz and G/SG models. Finally, to forecast in a medium and long horizon perspectives and compare the outcome to other forecasts provided by other commercial and academic sources when available.

ENERGY CONSUMPTION FORECAST IN 4G NETWORKS: THE CASE OF SPAIN
Claudio Feijoo, CEDINT-UPM
Co-Author(s): Rafael Coomonte, CEDINT-UPM, Jose-Luis Gomez-Barroso, UNED and Sergio Ramos, CEDINT-UPM

The share of global energy consumption due to ICTs systems and services is considerably increasing, and will continue during the next years. Its main cause is the raising trend in traffic generated by the usage of telecommunication networks, in particular through wireless broadband. In fact, as a response this new user demands, the telecom industry is starting the deployment of the fourth generation (4G) of mobile communications networks. However energy consumption is mostly absent from the debate on 4G networks deployment in spite of its potential impact both in operating expenses and sustainability. This paper addresses the forecast of energy consumption in 4G networks modeling the combination of three forces: the increase in traffic per mobile user, the increase in the penetration of wireless broadband technologies, and the decrease in energy consumption in each of the network elements. Conclusions are presented on the impact of energy in network design and operation. For calculations, the paper considers in detail the specific market situation and demographic distribution of users in Spain, although the model and conclusions can be easily extended to similar countries.

10:50 - 11:35 **TRANSFORMING THE US HEALTH CARE INDUSTRY** Room Maine
Chairperson: Hans Levenbach, Delphus, Inc. and Paul Savage, Health Care Intelligence LLC
Organizer: Hans Levenbach, Delphus, Inc.

TRANSFORMING THE US HEALTH CARE INDUSTRY: PANEL DISCUSSION AMONG PHYSICIANS AND INSTITUTIONAL LEADERS USING BIG DATA AND PREDICTIVE ANALYTICS
Raymond Campbell, Massachusetts Health Data Consortium and Ken Redcross, Western CT Medical Group

The transformation of the Health Care system in the United States is more than changing reimbursement models, but involves realigning the fundamental

incentives among the disparate parts of a complex system. We have experienced and learned in the course of thirty years to game the system and optimize revenue for each segment of the industry while devising the most sophisticated means and technology to treat and resolve health conditions. The industry is now being asked to transform itself into a more efficient model in which accountability is born not by the payers but by the providers of services. Whether it is Federal or State government, employers or individuals; the cost of care represented across the entire society requires a transformation of how we view clinical services. This panel discussion will focus on the realignment from a fee-for-service incentive system to one of outcomes in which population based medicine enhances the use of 'Best Practices', the quality of patient services and the long term costs to the health system. Greater alignment along the continuum of services will become essential to controlling costs while assuring access to the entire population with the appropriate level of care. This does not necessarily imply rationing but facilitates better management of public expectation, operational productivity, comprehensive quality improvement and realignment of incentives. The panelists will discuss the research and analytical capabilities that are available throughout the industry in order to embrace and make sense of a very large and complex system and the professional efforts that will be necessary for transformation.

11:40 - 12:25 **SCENARIOS AND FORESIGHT 3** Room Wellesley

Chairperson: Roy Pearson, Mason School of Business, The College of William and Mary
Organizer: Len Tashman, Editor of Foresight

TECHNOLOGY FORECASTS FOR STRATEGIC PLANNING
William Halal, George Washington University

People sense the world is passing through a Technology Revolution, but they lack good information. Professor William E. Halal will present results of his work on TechCast – a virtual think tank tracking the Technology Revolution. TechCast scans for trends and pools the knowledge of more than 100 experts online to forecast breakthroughs for corporations and governments in real time. The US National Academies cited TechCast as one of the top three systems in the world, Google searches rank it 2 or 3 out of 50 million hits, and it has been featured in the Washington Post, Newsweek, the Futurist, and other publications. Halal will describe the TechCast research method of "Collective Intelligence," present highlights of the results and "macroforecasts" of the impact on society, and discuss implications for technology forecasting systems.

11:40 - 12:25 **BIG DATA AND PREDICTIVE ANALYTICS IN HEALTHCARE** Room Maine

Chairperson: Hans Levenbach, Delphus, Inc.
Organizer: Hans Levenbach, Delphus, Inc.

PREDICTIVE ANALYTICS FOR CONGESTIVE HEART FAILURE -- A BIG HEALTHCARE DATA CHALLENGE
Paul Savage, Health Care Intelligence LLC

Health care entities have at their disposal, industry level transaction data, in many cases superior to those of other industries. However the techniques and

analytical capabilities among planners and executives have lagged far behind in making strategic use of these resources in demand planning. The scope of these data resources are in the process of expanding beyond just hospital inpatient activity. And this will soon represent opportunities to follow longitudinally the progression of disease throughout the community. We will explore some of these challenges in managing what amounts to 'Big Healthcare Data' and the necessity to transform such data into forecasts and strategic intelligence.
I will discuss a predictive analysis of Congestive Heart Failure (CHF) which is an extraordinarily expensive chronic disease involving the use of many levels of the health care system. Efforts are being made throughout the industry to better coordinate care, improve the quality of patient's lives and reduce the costs to society. We have the information resources available to perform this work but much more experience and insight is needed to effectuate the scope of change needed across the entire Health Care Industry.

BIG DATA AND PREDICTIVE ANALYTICS FOR HOSPITAL MANAGEMENT

Hans Levenbach, Delphus, Inc.

More and more hospital executives and planners are discovering that good demand forecasting can lead to improved short-term decision making about hospital mergers, closures and acquisitions, market share competition as well as a number of quality and disease management issues. Over the years these hospitals are taking a more granular approach to planning by introducing predictive analytic methodologies to ever-larger datasets of patient data. This allows them to forecast patient admissions and discharges by product and service categories along geographical and financial groupings. Hospital operating regions have become more geographically dispersed, as well, leading to new challenges in maintaining community service levels while trying to reduce operating costs. As a result, the need for robust planning practices with efficient and large database-oriented forecast support systems have given hospital administrators added reason to embrace predictive analytic tools and become more pro-actively involved in demand forecasting and strategic planning issues. In this talk, I will describe how a data-driven forecasting process is guiding planners to become key contributors to improved healthcare analytics for hospital management.

11:40 - 12:25 **DEMOGRAPHIC UNCERTAINTY IN MACROECONOMIC MODELING 2** Room Yarmouth

Chairperson/Organizer: Juha Alho, University of Eastern Finland

STOCHASTIC HOUSEHOLD FORECASTS BY COHERENT RANDOM SHARES PREDICTIONS

Nico Keilman, Department of Economics, University of Oslo
Co-Author(s): Coen van Duin, Statistics Netherlands

We compute probabilistic household forecasts for the Netherlands by the random share method. Time series of shares of persons in nine household positions, broken down by sex and five-year age group for the years 1995-2011 are modelled by means of Hyndman's product-ratio variant of the Lee-Carter model. This approach reduces the dimension of the data set by collapsing the age dimension into one scalar, specific for each household position and sex. As a result, the forecast task implies predicting two time series of time indices for each household position. We model these time indices as a Random Walk with Drift (RWD), and compute prediction intervals for them. Prediction intervals for random shares are simulated by using the Hyndman-Lee-Carter model. The random shares are combined with an independently computed stochastic forecast of the population of the Netherlands broken down by age and sex. We compare our results with Statistics Netherlands' stochastic household forecast, and with those based on RWD models for household shares for each combination of age, sex, and household position.

DEMOGRAPHIC FORECASTS IN THE LIFE-CYCLE SAVINGS MODEL

Niku Määttänen, Research Institute of the Finnish Economy

We incorporate demographic forecasts into a life cycle savings model with a mandatory pension scheme. Pension benefits may depend on demographic variables. Households optimize their behavior using demographic forecasts that are updated periodically. We use the model to evaluate different ways of linking pension benefits and/or retirement age to longevity. Such reforms have recently been undertaken in many countries.

FORECASTING FUTURE DEMOGRAPHIC FORECASTS

Juha Alho, University of Eastern Finland

The problem of how how one best anticipates demographic forecasts that are only made in the future arises in the analysis of macroeconomic overlapping generations models. When these are formulated in a stochastic demographic setting, it is natural to assume that decisions concerning labor supply and demand are adjusted, as demographic development turns out to differ from what was initially forecasted. Thus, conditionally on a given path of demographics from jump-off time to some future time $t > 0$, we need to know what would be the forecast at t, for demographics at future times $t + s$, $s > 0$. In this paper both analytical and numerical approaches for solving this problem are discussed.

11:40 - 12:25 **FINANCIAL CRISES** Room Massachusetts
Chairperson: Matthew Schneider, Cornell University

MACROECONOMIC FORECASTING AFTER THE 2007-09 GLOBAL CRISIS: LESSONS AND THE WAY FORWARD
Jacques Ngoie, University of Pretoria

The most recent global crisis which turned world economies in tatters has provoked a crisis of confidence and raised severe criticisms against macroeconomists and their ability to understand and predict major economic turning points. In this paper, I investigate current state-of-the-art macroeconomic models, highlight their major weaknesses identified as cause of their failure to accurately predict the 2007-09 crisis and advise on potential 'remedies'. Subsequently, I develop an expanded version of the Marshallian Macroeconomic Model Disaggregated by sectors (MMM-DA); see Zellner and Ngoie (2012). Using U.S. data, this paper provides forecasting results obtained from the MMM-DA and highlights the model's superior forecasting performance vis-à-vis three current state-of-the-art models: the Dynamic Stochastic General Equilibrium model; the BVAR (Bayesian Vector Autoregressive) model; and the GVAR (Global Vector Autoregressive) model. Among other technical features of the MMM-DA explored in this study, this paper offers a detailed discussion on bifurcation boundaries and how they affect estimation and forecasting results of macroeconomic models. When faced with bifurcation boundaries, dynamic models have parameter spaces that are stratified into several subsets which are not topologically equivalent causing substantial damages to robustness of inferences drawn from dynamic models. This study provides a Bayesian alternative to address the issue.

FORECASTING OF FINANCIAL CRISIS PERIODS: A MODELING APPROACH
Matthew Schneider, Cornell University
Co-Author(s): Noomene Rouhia, UPC

The global financial crisis is sucking countries into a world of deep recession. In the U.S., the world's other huge advanced economic area, most economists still expect the country to enter election year in modest recovery mode. With unemployment falling and recent growth rates higher than in Europe on the back of higher consumer spending, recent survey data have pointed to continued growth at unexciting rates. To what extend can we confirm this survey?
Many economists classify the economic activity into expansions and recessions through turning points. In this paper we study some economic indicators; how far they are able to forecast these turning points for the next few months and we analyze their forecast accuracy. We use the receiver operating characteristic (ROC) Curve as a new method in the field of economics and the partial area under the curve (PAUC) criterion as a forecast accuracy measure. We compare the results with the real economic activity data during the same period. US economic data from the National Bureau of Economic Research (NBER) are used in this study.

Keywords: recession, expansion, economic activity, financial crisis, Forecasting, receiver operating characteristic (ROC) curve, partial area under the curve (PAUC).

11:40 - 12:25 **FORECASTING SOFTWARE PROVIDERS B** Room Simmons
Chairperson/Organizer: Stephan Kolassa, SAP (Schweiz) AG

DEMAND FORECASTING WITH PARTIAL POS DATA USING IN-MEMORY TECHNOLOGY
Tim Januschowski, SAP Innovation Center
Co-Author(s): Arzum Akkas, Massachusetts Institute of Technology, Cambridge, Enno Folkerts, SAP AG, Walldorf, Ralf Heimburger, SAP AG, Walldorf, Martin Lorenz, Hasso Plattner Institute, Potsdam University, Christian Schwarz, Hasso Plattner Institute, Potsdam University, David Simchi-Levi, Massachusetts Institute of Technology, Cambridge and Nataly Youssef, Massachusetts Institute of Technology, Cambridge

An important challenge in Consumer Packaged Good, Food and Beverage and other industries, is to generate accurate and reliable consumer demand forecasts. Such forecasts can be used by manufacturers to coordinate production and distribution and, more importantly, to manage store inventory in direct to store operations. Unfortunately, developing effective forecast is not trivial even when POS data is available, but raises significant challenges when POS data does not exist either due to lack of technology or due to resistance to share information. In this talk, we present preliminary results on our approach to develop effective consumer demand forecasts using a combination of shipment data, which is data readily available to manufacturers, and partial POS data. One important challenge in this area is to deal with the vast amount of shipment data. In the talk, we focus on applying in-memory technology to enable the creation of fast and flexible demand forecasts.

PERCENTAGE ERRORS CAN RUIN YOUR DAY
Roland Martin, SAP (Schweiz) AG
Co-Author(s): Stephan Kolassa, SAP (Schweiz) AG

The MAPE and its variants are probably the most widespread error metrics used by forecasting practitioners, and for good reason: they are intuitive and can be used to assess accuracy for both individual products and across product groups.
One important problem that has not received adequate attention arises when the MAPE is used as the basis for comparing different methods or systems: using the MAPE for comparisons rewards methods that systematically underforecast, especially for series that fluctuate widely.
We provide a simple illustration of this problem, which is suitable for non-technical audiences, by rolling dice (actually a single die) a few times. The example reveals how forecasts chosen on the basis of lowest MAPE can be seriously biased on the low side.

11:40 - 12:25 **ICT/TELECOMMUNICATIONS B** Room Tufts
Chairperson/Organizer: Gary Madden, Curtin University

FIRM LEVEL INNOVATION DIFFUSION OF 3G MOBILE PHONES IN A INTERNATIONAL CONTEXT: IMPACT OF WITHIN AND CROSS BRAND COMMUNICATIONS AND COMPETITIVE STRUCTURE

Towidhul Islam, University of Guelph
Co-Author(s): Nigel Meade, Imperial College Business School, London

The relative success of 3G service providers is different within countries and between countries. To examine the reasons for the differences in firm level diffusion of 3G mobile phones across countries, we investigate the impact of word of mouth and a range of market factors. Competitive fractionalization is used a measure of the differences in relative penetration of firms in the market. We incorporate comprehensive socioeconomic and telecommunications data covering geographically and economically diverse countries and control for covariates from literature. We use recent developments of firm level diffusion models (extended from the category level Bass Model) and our model estimation uses pooled multinational firm level data. Our findings will aid international managers and regulators in their strategy and policy formulations. Finally, we demonstrate model validity by model fit and predictive accuracy.

THE FORECASTING ACCURACY OF POST-AWARD NETWORK DEPLOYMENT MODELS: AN APPLICATION OF MAXIMUM SCORE TESTS

Gary Madden, Curtin University
Co-Author(s): Walter Mayer, The University of Mississippi and Chen Wu, Black Hills State University

Mobile phone providers are assigned spectrum by national governments. Licenses awarded by auctions are tied to post-award network deployment obligations. This paper evaluates the forecasting accuracy of binary response models of whether obligations are met using panel data of annual observations on 20 countries for 2000-2007. Forecasts are conditioned on macroeconomic and market conditions, and package attributes. Model evaluation is by Mayer and Wu (2012) maximum score tests. Traditional probit models are not robust to error misspecifications. However, Manski's (1975, 1985) maximum score estimator imposes only median independence and allows arbitrary heteroskedasticity. An obstacle for empirical implementation is that the asymptotic distribution of the estimator cannot be used for hypothesis testing. Mayer and Wu address the problem using a 'discretization' procedure. The tests do not impose additional assumptions on the data generating process, require less computational time than subsampling, and are applicable to nested and non-nested hypotheses. Test statistics are based on the difference between the objective functions maximized by the maximum score estimators under the null and alternative hypotheses and as such reflect differences in predictive accuracy.

11:40 - 12:25	**NOWCASTING** Chairperson: Nii Ayi Armah, Bank of Canada	Room New Hampshire

NOWCASTING GDP: ELECTRONIC PAYMENTS AND THE TIMING OF DATA RELEASES
John Galbraith, McGill University
Co-Author(s): Greg Tkacz, St Francis Xavier University

We assess the usefulness of a newly constructed data base of electronic payments, namely debit and credit card transactions as well as cheques that clear through the banking system, as indicators of current GDP growth. Apart from capturing a broad range of spending activity, these variables are available well before the current-quarter GDP estimate, making them suitable candidate indicators for current-quarter forecasting (`nowcasting'). Controlling for the release dates of indicators, we generate nowcasts of GDP growth for a given quarter over a span of five months, which is the period over which useful advance estimates of GDP could be given. We find that nowcast errors fall by about 80 percent between first and final nowcasts, and that payments variables lower the nowcast erros by between zero and 40 percent. These improvements are achieved only when all payments variables are included in the model, so thta any substitution among payment modes is captured.

PREDICTIVE DENSITIES AND STATE SPACE NOWCASTING
Nii Ayi Armah, Bank of Canada

The state space form (SSF) of a single dynamic factor model is used to extract information from macroeconomic and financial variables at weekly, monthly and quarterly frequencies to nowcast real quarterly GDP growth rate for Canada and the United States. In addition to point predictions, we also generate predictive densities that provide a measure of uncertainty around the point predictions as well as an assessment of risk by virtue of the probability of tail events. One major contribution of this paper to the nowcasting literature is that our predictive densities have no known functional form. The conditional distributions are generated by stochastic simulation of historical empirical distributions. The Kalman filter is used for signal extraction and to estimate the model’s hyperparameters. An important advantage of using the Kalman filter on mixed frequency data is that the filter remains valid even for missing data values. Out-of-sample nowcast performance under recursive and rolling estimation schemes are evaluated in a number of predictive experiments using pseudo real-time data. Results suggest that our nowcasting model outperforms alternative benchmarks and the associated predictive densities are not outperformed by alternative parametric densities.

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11:40 - 12:25 **Energy Forecasting** Room Hyannis
Chairperson: Kees Bouwman, Erasmus University Rotterdam

FORECASTING SHORT TERM ELECTRICITY PRICES
Presented by Kees Bouwman, Erasmus University Rotterdam
Co-author(s): Dick van Dijk, Erasmus University Rotterdam and Eran Raviv, Erasmus University

In this paper we show that taking into account the intra-day relation between the individual hourly electricity prices is beneficial for day ahead spot price forecasting. We do so by estimating several multivariate models, models that allow for cross lags as explanatory variables as opposed to just own lags, and compare them with a viable univariate modelling alternative. We deal with the inherent over-fitting problem using shrinkage and dimension reduction methods such as Bayesian VAR, reduced-rank regression and principal components regression. We further show that additional gain can be achieved using forecast combination

FORECASTING NATURAL GAS DEMAND: THE ROLE OF PHYSICAL AND ECONOMIC FACTORS Thomas Quinn, Marquette University Coauthors: Ronald Brown, Department of Electrical and Computer Engineering, Marquette University, David Clark, Department of Economics, Marquette University, Catherine Twetten, Department of Economics, Marquette University, Farrokh Nourzad, Department of Economics, Marquette University and George Corliss, Department of Electrical and Computer Engineering, Marquette University

Natural gas is an important source of clean energy used for residential, commercial and industrial purposes. Given the environmental concerns associated with the combustion of coal, demand for natural gas has grown, and it is expected to be the primary US fuel source by 2030. With this increase in demand, gas providers must anticipate demand levels, while keeping costs to a minimum. Deriving accurate short run and long run forecasts of natural gas demand is a key factor in coordinating the demand and supply side of the market. In this study, we develop econometric forecasting models of sectoral demand for natural gas. We investigate the role that physical factors related to weather as well as economic factors related to local and national economic conditions play in determining demand for natural gas. Separate monthly demand models are derived for the various sectors and for geographically distinct markets in the US. Ex-post forecast performance is compared for both short run (1 year) and long run (2-5 year) time horizons. Preliminary findings suggest that while most of the variation

in natural gas usage can be explained by physical variables, forecasting performance is enhanced by the inclusion of economic variables.

Added paper to proceedings:

FORECASTING AND SUCCESSION PLANNING IN SMALL AND MEDIUM BUSINESS ORGANIZATIONS IN NIGERIA - (PaperID: 14), Presenter(s): Rukevwe Ogedegbe, Ajayi Crowther University

In recent years, organizations have become concerned with a range of issues of future capabilities. Thus, the need to integrate plans and activities of human resource management with business priorities and forecasts. The global challenges facing all forms of business requires business managers to be more proactive towards the transformation of its human resource needs not only to weather immediate problems, but to aid in the achievement of permanence in the business arena. The study thus aims to research the following questions: How do small and medium business organizations forecast their human resources needs and how do these forecasts contribute towards succession planning of the organization? Using data information from a study of 160 selected small and medium business firms in Nigeria, the study shows the importance of human resource planning in current organizational scenarios, succession planning and the impact of external and internal issues - technology, organizational structure- on the human resource planning process.

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