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K1
Plenary Session

Monday 8:15AM-9:15AM Room: Astor Ballroom

Chair: Kajal Lahiri
University at Albany - SUNY, USA

Measuring Expectations

Charles F. Manski
Northwestern University, USA

Economists have long sought to predict choice behavior. The standard practice has been to infer decision processes from data on observed choices. These inferences are then used to predict behavior in other settings. Economists typically assume that decision makers form probabilistic expectations for future events and maximize expected utility. Observed choices may be consistent with many alternative specifications of preferences and expectations. To cope with this identification problem, economists commonly assume particular sorts of expectations and they suppose that expectations are rational, that is, objectively correct. This reduces the task of empirical analysis to inference on preferences alone, but it has contributed to a crisis of credibility. Economists analyzing choice data often have enormous difficulty defending the expectations assumptions they maintain and, as a consequence, have similar difficulty justifying the findings they report.
Rather than make assumptions about expectations, it would be better to measure them in the form called for by modern economic theory; that is, subjective probability distributions. Since the early 1990s, economists engaged in survey research have increasingly asked respondents to report probabilistic expectations of significant personal events. Expectations have been elicited for macroeconomic events (stock market returns), for risks that a person faces (job loss, crime victimization, mortality), for future income (earnings and Social Security benefits), and for choices that persons make (durable purchases and voting choices). Probabilistic expectations have also been elicited from professional forecasters (inflation and GDP forecasts). In this presentation, I discuss the history underlying the new literature, describe some of what has been learned thus far, and look ahead towards making further progress. The presentation draws in part on my review article: C. Manski, ''Measuring Expectations,'' *Econometrica*, 2004.

Charles F. Manski is a Board of Trustees Professor in Economics at Northwestern University. He formerly was a faculty member at the University of Wisconsin-Madison, the Hebrew University of Jerusalem, and Carnegie Mellon University. He received his B.S. and Ph.D. in economics from M.I.T. His research spans econometrics, judgement and decision, and the analysis of social policy. Dr. Manski is a fellow of the Econometric Society, The American Academy of Arts and Sciences, and the American Association for the Advancement of Science. He has been editor of the *Journal of Human Resources*, co-editor of the Econometrica Society Monograph Series, and associate editor of the *Journal of Economic Perspectives*, *Econometrica*, the *Journal of the American Statistical Association*, and *Transportation Science*. He is the author of numerous books and articles in professional journals.

EN1
Contributed Session: Electricity I

Monday, 9:15am-10:45am Room: Soho

Chair: Rob Hyndman
Monash University, Australia

A smooth transition periodic autoregressive model for short-term electricity load forecast

Luiz Felipe Amaral, Reinaldo Castro Souza
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Maxwell Stevenson
University of Sydney, Australia

This article considers a nonlinear approach to obtain short term forecast for electricity load. The model combines a smooth transition autoregressive process with a periodic autoregressive time series model, creating the smooth transition periodic autoregressive (STPAR). A model-building procedure is developed with simple statistical methods and a linearity test against smooth transition periodic autoregressive. A further two tests were created to evaluate the model: a Lagrange multiplier (LM) test for the hypothesis of no error autocorrelation and LM-type test for the hypothesis of no remaining non-linearity. A Monte Carlo experiment was implemented to evaluate the performance of the proposed tests. Estimation by nonlinear least squares is considered. Finally, load data from New South Wales state in Australia's electricity retail market is presented and it will be used as a real example. Other models were used to compare the performance of such model.

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Short Term Load Forecasting Using Double Seasonal Exponential Smoothing

Cristina Vidigal Cabral de Miranda, Reinaldo Castro Souza, Monica Barros
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The forecast for high frequency data is fundamental for the safety and reliability of the electric power system operation. The methods of exponential smoothing, particularly the Holt-Winters approach and its variations, are appropriate for this type of data due to its highly adaptability, robustness and simplicity.

This work seeks to produce forecasts, every fifteen minutes, for a time horizon of seven days ahead, that is, 672 steps of fifteen minutes ahead, for a brazilian load series of an important distribution utility located in the southeast region of the country. It is considered the two-clycle version of the Holt-Winters approach as proposed recently by J. Taylor, including some improvements, such as, the treatment of bank holidays and the influence of temperature, acting as exogenous inputs. As a result, the produced forecasts present substantial improvements, when compared with those obtained by the straightforward use of the Holt-Winters approach without these proposed treatments of bank holidays and temperature.

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Short and Long-Term Load Forecasting: The Network Manager's Nightmare

Jiri Svec, Maxwell Stevenson
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Network administrators are confronted with the need to access reliable short and long-term electricity load forecasts on a regular basis. Legislation places stringent demands on market participants to meet load requirements in the short and long-term. This paper addresses problems associated with both short and long-term electricity load forecasting and develops models for forecasting load over both horizons. While we find that long-term load forecasts are dominated by trend and cyclical behaviour, of particular interest to us is the determination of the usefulness of temperature in forecasting short-term electricity load. We examine the well accepted proposition that short-term load bursts are also precipitated by high and low temperature episodes.

In order to address the problem of forecasting elevated short-term load, we adapted the long-term forecasting model for short-term load forecasting and introduced lagged temperature as covariates in the model specification. In order to further improve the short-term load forecast, we introduced an innovative model for fitting accurate intraday temperature profiles into our short-term electricity load forecasting model. This model, that we call the six pack model, is a six-parameter model requiring daily maximum and minimum temperature forecasts as inputs. The model is based on exponential functions which offer a more flexible functional form than the commonly used sinusoidal model. This model produced a more accurate intraday temperature profile that translated to improved short-term load forecasts, particularly in periods of elevated demand for load.

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Forecasting medium- and long-term peak electricity demand

Rob Hyndman
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Peak electricity demand forecasting is important in medium and long-term planning of electricity supply. Extreme demand often leads to supply failure with consequential business and social disruption. Forecasting extreme demand events is therefore an important problem in energy management.

Electricity demand at a given time is subject to a range of influences, including the ambient temperature, recent past temperatures, time of day, day of week, holidays, economic conditions and so on. I develop a semi-parametric model for half-hourly demand incorporating such weather, calendar and economic variables. The model is used to forecast upper-tail percentiles of electricity demand over a ten year horizon.

In order to forecast electricity demand using the model, we need to forecast all explanatory variables including temperature. To simulate future temperatures at half-hourly intervals, and thereby obtain the forecast distribution of temperature, a seasonal bootstrap method has been developed.

The method is demonstrated using half-hourly South Australian demand data from 1997-2006 with forecasts obtained for 2007-2016.

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BC1
Contributed Session: Exchange Rates I

Monday 9:15am-10:45am Room: Duffy

Chair: Richard H. Cohen
University of Alaska Anchorage, USA

Discussion for Managed Discrete Floating Exchange Rate System Based on Political Change of Balance of Payments in China

Liu Bai, Zhang Ailian
Jilin University, P.R. China

In the process of the combination of Chinese economy with international economy, financial reform is one of the anticipated focuses. Further the stability of exchange rate is the necessary condition for the sustainable development of macro economy. Therefore, this article gave out managed discrete floating exchange rate system, and it is important to study the relationship between the political change of balance of payments and stability of RMB. Through the trend of various economic variables and exchange rate forecast model etc, this article verifies that the reducing quantity of balance of payments items, such as net export, FDI and foreign exchange reserve, can impair the pressure of RMB appreciation, so that assure the health and sustained development of Chinese economy under the reasonable expectation.

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Direct vs. indirect forecasting of the defined real exchange rate in South Africa

Marinda Pretorius, Ilsa Botha
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The implicit volatility associated with developing economies creates several problems in terms of the forecasting of many macroeconomic variables. South Africa specifically is characterised by a volatile exchange rate. This paper investigates the real exchange rate for South Africa in order to improve the forecast accuracy of the exchange rate. The real exchange rate of South Africa is forecasted using the direct and indirect methods of forecasting, given that the real exchange rate is a defined variable. Direct forecasting is based on modelling a time series on the real exchange rate, whereas indirect forecasting is based on modelling the time series on the individual defining variables. By using the direct method forecasts are generated from models estimated directly from time series on the real exchange rate, and by means of the indirect method forecasts were generated by applying the same models, for the fundamental components of the real exchange rate.

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Out-of-Sample Exchange Rate Predictability with Taylor Rule Fundamentals

David Papell, Tanya Molodtsova
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An extensive literature that studied out-of-sample performance of empirical exchange rate models following Meese and Rogoffs (1983a) seminal paper has not yet convincingly overturned their result of no out-of-sample predictability of exchange rates. The recent empirical research by Cheung, Chinn and Pascual (2005) concludes that none of the standard models of exchange rate determination consistently outperforms the random walk model at any horizon. This paper re-evaluates the short and long-term predictability of empirical exchange rate models using Clark and Wests (2005a) recently developed inference procedure for testing for equal predictability of two nested models. We extend the conventional set of models of exchange rate determination the flexible price monetary model and its two building blocks (uncovered interest rate parity and purchasing power parity) by investigating predictability of two models that incorporate a Taylor-rule interest rate reaction function. The out-of-sample performance of the models is assessed at 1 to 36 month horizons for a set of 12 currencies over the post-Bretton Woods float. The paper provides evidence of short-term exchange rate predictability, which could not be observed using the standard inference procedure prevailing in the previous literature. The evidence of predictability is much stronger with Taylor rule models than with conventional models. There is no significant evidence of increased predictability of economic models relative to a random walk at long horizons.

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Specifying the Forecast Generating Process for Exchange Rate Survey Forecasts

Richard H. Cohen
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Carl S. Bonham
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This paper contributes to the literature on the modeling of survey forecasts using learning variables. We use individual industry data on yen-dollar exchange rate predictions at the two week, three month, and six month horizons supplied by the Japan Center for International Finance. Compared to earlier studies, our focus is not on testing a single type of learning model, whether univariate or mixed, but on searching over many types of learning models to find congruent ones. In addition to including the standard expectational variables (adaptive, extrapolative, and regressive), we also include a set of interactive variables which allow for lagged dependence of one industry's forecast on the others. Our search produces a remarkably small number of congruent specifications-even when we allow for 1) a flexible lag specification, 2) endogenous break points and 3) an expansion of the initial list of regressors to include lagged dependent variables and use Hendry's General-to-Specific modeling strategy. We conclude that, regardless of forecasters' ability to produce rational forecasts, they are not only "different," but different in ways that cannot be adequately represented by learning models.

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FM1
Contributed Session: Judgemental Adjustments

Monday 9:15am-10:45am Room: Hudson

Chair: Robert Fildes
Lancaster University, UK

Judgmental Adjustments: Effects of Prior Adjustments and Explanations

Dilek Onkal, M. Sinan Gonul,
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Michael Lawrence
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In many organizations, it is quite common for forecast users to receive predictions that have previously been adjusted by providers or other users of forecasts. Current work investigates some of the factors that may influence the size and propensity of further adjustments on already-adjusted forecasts. Two studies are reported that focus on the potential effects of adjustment framing (Study 1), and the availability of explanations and/or original forecasts alongside the adjusted forecasts (Study 2). Study 1 provides evidence that the interval forecasts that are labeled as adjusted are modified less than the so-called original/unadjusted predictions; with both groups modifications leading to deteriorations in point forecasting accuracy. Study 2 suggests that the provision of original forecasts and the presence of explanations accompanying the adjusted forecasts serve as significant factors shaping the size and propensity of further modifications. Findings o! f both studies highlight the importance of forecasting format and user perceptions with critical organizational repercussions.

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Analysing forecast adjustment behaviour

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Forecast data has been collected at monthly SKU level from three large manufacturing UK companies. The data collected comprises over 10,000 data sets where each set is the actual, the statistical forecast and the final forecast (which differs from the statistical if an adjustment has been made). For the two to three years of data collected, the percentage of forecasts adjusted for each organisation was high lying in the range 6192%. One of the striking findings of the study is that a third of the adjustments are in the wrong direction. A wrong direction adjustment is, for example, where the forecast is adjusted up from the statistical forecast but the actual is below the statistical forecast. Understandably, a wrong sided adjustment has a very bad impact on forecast accuracy. This paper seeks to understand the reasons for such a high level of wrong sided adjustments and relates this to the previous period outcome, the reliability of the information motivating the adjustment and the noise in the series. Up adjustments are found to exhibit quite different characteristics to down adjustments. The optimism bias which is prevalent in most forecasting activity is less noticeable in forecast adjustments. Simple lessons are proposed to greatly lessen wrong sided adjustments and so improve the benefits of forecast adjustments.

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Forecasting with Judgment and Models

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This paper proposes a parsimonious and model-consistent method for combining forecasts generated by structural micro-founded models and judgmental forecasts. The goal is to produce forecasts that are model-based, and therefore disciplined by the rigor of the economic model, but that can also incorporate judgmental information. In our set-up, there are three actors: the economic agents and two types of forecasters, the purely-model based and the judgmental forecasters. They all know the true model of the economy, but their information sets differ. The economic agents observe shocks as they realize and make their decisions consequently, while the forecasters do not observe current shocks. The judgmental forecasters however have access to more timely information than the purely model-based forecasters, but their forecasts are affected by some noise (i.e. they are not perfectly rational). Thus, the idea is to extract such information from the judgmental forecasts. This method also allows interpreting the judgmental forecasts through the lens of the model. We illustrate the proposed methodology with a real-time forecasting exercise, using a stripped-to-the-bone version of an RBC model and the Survey of Professional Forecasters.

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Bootstrapping judgemental adjustments to improve forecasting accuracy

Robert Fildes
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This paper examines the judgemental adjustments made to over 12K SKU statistical demand forecasts from four companies. The aim is to establish whether there are any consistent errors that can be capitalized on to improve these forecasts. Simple bootstrap models of the forecasts are developed and contrasted with the Blattberg-Hoch 50% model + 50% man heuristic as well as various statistical base lines. In all the companies the bootstrap improved accuracy overall. But the strength of the results depended on how the forecasters responded to the market intelligence they received. We conclude by suggesting methods and processes that should ensure companies and their forecasters become more reliable and more efficient.

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BC2
Contributed Session: GDP I

Monday 9:15am-10:45am Room: Chelsea

Chair: Tapas Mishra
International Institute for Applied Systems Analysis, Austria

Agriculture and economic growth in Africa revisited: A modified Okun's Law

Adusei Jumah, Robert M. Kunst
University of Vienna, Austria

In recent years, the relationship between agriculture and economic growth is being reexamined in the literature. The old development mantraproduce more food, feed more peopleis giving way to a new call: Create more jobs, provide income to buy food. Because wages in agriculture cannot grow in the presence of an unlimited labor supply at the subsistence wage, the benefits of technological progress in agriculture in terms of improved productivity cannot be reaped, unless economic growth raises aggregate demand. In order to examine the validity of this argument, we consider a modification of Okuns Law in a vector autoregressive framework using data on several African countries. The model is evaluated by means of impulse response analysis and of various forecasting experiments.

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GDP Forecasting with Real-Time Data

Roberto Golinelli
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Giuseppe Parigi
Bank of Italy

The aim of the paper is to investigate the information content of model-based GDP early estimates vis-a-vis that of the first (official) releases of the statistical agencies. To do so, we use the historical information set of what has been published in real-time to estimate alternative forecasting models. Then, one quarter ahead GDP forecasts of these models are compared with the corresponding first and intermediate (the last before a benchmark revision) GDP official releases to assess the ability in predicting latest-available GDP figures, supposed to be no longer revised (i.e. the ''true'' picture of the actual economic situation). In other terms, we interpret preliminary official releases of GDP growth rates as predictions of the actual GDP data, and we assess their forecasting ability against a number of alternative models made in real time. In doing so, we tackle a number of topics of the forecasting literature with real-time data in the same context, ensuring a better comparability of the results. First, it is well known that forecasts for a particular date change as data vintage change. Therefore, the out-of-sample GDP forecasting ability of alternative models (from the simplest random walk to the more complex models using larger information sets of indicators) is assessed across data vintages. Second, models selection and specification are conducted with the same procedure of automatic-inference across vintages using only the samples available at each date the models are made. PcGets is a procedure of in-sample model fitting that prevents ex-post information from creeping into the model through the knowledge of the researcher in recursive modelling over time. Third, strictly related with the previous two, the predictability of a number of indicators for GDP is assessed in real-time. The forecasting exercises are applied to both Italy and US quarterly GDP data.

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Projecting the Medium-Term: Methods, Outcomes and Errors for GDP Growth

Marcus Kappler
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The main focus of this paper is the evaluation of a very popular method for potential output estimation and medium-term forecasting - the production function approach - in terms of predictive performance. For this purpose, a forecast evaluation for the three to five years ahead predictions of GDP growth for the individual G7 countries is carried out. A lot of papers examine the performance and outcomes of the many empirical methods to estimate potential output ex post and retrospectively look at the estimation results of an unobserved component that is quite important for many applications. Since a natural benchmark for potential output estimates does not exist, such exercises can not really help to appraise whether the estimated figures are appropriate guidelines or not. In contrast, the present paper follows a different approach which has the distinct advantage that an obvious benchmark against which the predictions can be evaluated exists, namely observed growth rates over medium-term periods. To carry out the forecast performance check, a particular testing framework is derived that allows the computation of robust test statistics given the specific nature of the generated out-of sample forecasts. In addition, medium-term GDP projections from national and international institutions are examined and it is assessed whether these projections convey a reliable view about future economic developments and whether there is scope for improving their predictive content.

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Demographic Volatility, Output Persistence and Forecasting: A Fractional Integration Test for Demography-based GDP forecasts using Long-term Swedish Data

Tapas Mishra
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Thomas Lindh, Bo Malmberg
Institute for Futures Studies, Sweden

Recent theoretical and empirical advances in linking economic growth and demographic change have re-affirmed that demographic age structure offers important clues to puzzling findings like the lack of convergence in growth rates over the world. Most growth models still assume that the demographic system basically is stable. Even if it is often assumed it is still unknown whether the demography system (with continuous interaction with the aggregate economy) will tend to converge to a stable long-run equilibrium level. Looking at the recent demographic trends and the impact of endogenous demographic shifts (possibly leading to chaotic dynamics in economic growth), this assumption ignores much of the demographic dynamics and its role in economic growth, now and in the future. In view of this, our objective in this paper is twofold: First, we estimate whether population growth conforms to a long-memory data generation process. Second, based on the stochastic demography-economic system, we would like to forecast output. The idea is that small amount of shocks upon accumulation over time, can affect the economic system substantially. We model the volatility of the demography-economic growth system in order to perform long-term projections. The forecast properties out of sample are evaluated against other benchmark models to determine whether modeling the long memory in the process improve on forecasting GDP growth. Indeed GDP and demographic structure is found to be cointegrated in the period 1820-2000 and modeling the ARFIMA process does improve on the stability of estimated coefficients.

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F1
Contributed Session: Finance I

Monday 9:15am-10:45am Room: Gotham

Chair: Hany Shawky
University at Albany - SUNY, USA

Bayesian portfolio selection using multifactor model and Bayesian predictive information criterion

Tomohiro Ando
Keio University, Japan

Bayesian portfolio selection methods are developed to extend the standard mean-variance method. The proposed methods employ empirical Bayesian and Bayesian model averaging approaches to account for uncertainty about the estimation and model specification risks, which are ignored in the standard mean-variance method. In these Bayesian portfolio selection contexts, several parameters within the predictive distribution of the asset return, such as the factors and the employed models, are to be optimized. This problem is investigated from a statistical point of view and the use of Bayesian predictive information criterion is considered.

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Do Analysts Who Issue Cash Flow Forecasts Predict More Accurate Earnings?

Jinhan Pae, Choong-Yuel Yoo, Shiheng Wang
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This paper examines the impact of analysts' issuing cash flow forecasts on their earnings forecast accuracy after controlling for analysts propensity to issue cash flow forecasts. We find that there is no significant cross-sectional difference in earnings forecast accuracy between cash flow forecast issuers and non-issuers. However, earnings forecast accuracy increases (decreases) when analysts start (cease) to issue cash flow forecasts. Taken together, we conclude that issuing cash flow forecasts improves earnings forecast accuracy; but, the benefits of issuing cash flow forecasts are limited in the sense that cash flow forecast issuers do not predict more accurate earnings than non-issuers. We also find that analysts who start or cease to issue cash flow forecasts concurrently adjust their earnings forecast frequency to complement the effect of issuing cash flow forecasts on earnings forecast accuracy, and that cash flow forecasting performance is positively related to their earnings forecasting performance.

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Is it cold up north? - The liquidity on the Scandinavian stock exchanges

Jonas Soderberg
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Two monthly liquidity measures (proposed in Amihud (2002) and Lesmond, Ogden and Trzcinka (1999)) are used to calculate the development of liquidity (both as equally weighted and value weighted) on the stock exchanges in Copenhagen (Denmark), Oslo (Norway) and Stockholm (Sweden) between January 1993 and June 2005. As these stock exchanges are in transition, closely integrated, nearly the same size, similar market regulations and trading system these stock markets are interesting to examine and to make comparisons between the markets, in spite of that the Nordic stock markets are relatively small. In a vector auto regression (VAR) framework the relationship between return, volatility, trading activity and liquidity is explored and how other macro variables (monetary policy, exchange rate, portfolio flows) affect the variations in liquidity. The joint dynamics of liquidity on these three stock exchanges are examined to see if there are any cross-market liquidity effects. This paper is an important contribution to understanding liquidity dynamics, as to best of my knowledge there has been no similar studies outside the U.S. and with comparisons between different markets. A more thoroughly investigation which macro market variables significantly predict the liquidity is conducted compared to previous studies as both VAR and seemingly unrelated regression are used. The stock market return significantly predicts the market liquidity for these stock exchanges, tested with Granger-causality and impulse response functions. The shocks to liquidity are highly positive between these exchanges, suggesting high liquidity risk and that diversification benefits may be lost. A positive change in the term spread or a negative change in the short term interest rate will increase the liquidity, and this could explain the ‘‘flight-to-quality’’-phenomenon observed in finance.

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The Effect of Regulation FD on Market Reactions

Rong Yang
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The U.S. Securities and Exchange Commission (SEC) issued Regulation Fair Disclosure (FD) on October 23, 2000, which prohibits selective disclosure of material nonpublic information to certain financial analysts, institutional investors and others prior to making it available to the general public. This study investigates the effect of Regulation FD on market reactions for closed-call firms and open-call firms as well as non-conference-call firms in the post-FD periods. Given conference calls increase the information gap between analysts privy to the call and the remainder of investors before Reg. FD took effect (Bowen, Davis and Matsumoto 2002), this study further analyzes price reactions between previous closed-call firms and previous open-call and non-conference-call firms after the release of the new regulation. This study provides evidence that the new rule did reduce the price volatility for firms that previously limited access to their calls. Moreover, I find that price volatility around earnings announcement dates in two windows are not significantly different between the previous closed-call firms and control groups (including open-call and non-conference-call firms) after the implementation of Reg. FD. Overall, these findings imply that, to some extent, Regulation FD did ‘‘level the playing field’’ for financial analysts and investors, consistent with Regulation FDs success in eliminating selective disclosure.

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EC1
Invited Session: Advances in Panel Analysis

Monday 9:15am-10:45am Room: Gramercy

Chair: Joao V. Issler
Getulio Vargas Foundation, Brazil

On Forecasting Count Panel Data

Brajendra C. Sutradhar
Memorial University of Newfoundland, Canada

Recently, Sutradhar (2007, *Journal of Forecasting*, in Press) has proposed an observation-driven auto-regression model for time series of counts with possible overdispersion. The proposed model, after estimating the parameters involved, by a generalized quasi-likelihood (GQL) approach, appears to forecast a future count very well. In this talk, I explain how one can exploit this approach to forecast a future count in a panel data set up. Some simulation results on model misspecification effects on forecasting will also be presented.

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Comparing Alternative Predictors Based on Large-Panel Factor Models

Antonello DAgostino
Central Bank and Financial Services Authority of Ireland

Domenico Giannone
Universit Libre de Bruxelles

This paper compares the predictive ability of the factor models of Stock and Watson (2002) and Forni, Hallin, Lippi, and Reichlin (2005) using a ‘‘large’’ panel of US macroeconomic variables. We propose a nesting procedure of comparison that clarifies and partially overturns the results of similar exercises in the literature. As in Stock and Watson (2002), we find that efficiency improvements due to the weighting of the idiosyncratic components do not lead to significant more accurate forecasts. In contrast to Boivin and Ng (2005), we show that the dynamic restrictions imposed by the procedure of Forni, Hallin, Lippi, and Reichlin (2005) are not harmful for predictability. Our main conclusion is that for the dataset at hand the two methods have a similar performance and produce highly collinear forecasts.

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Deriving Economic Shock and Volatility Estimates from Panel Data of Survey Forecasts

Antony Davies
Duquesne University, USA

The paper demonstrates that previously published frameworks for analyzing multi-dimensional panel data of forecasts imply the existence of new and richer measures of economic shocks and volatilities. Three types of economic shocks are shown (cumulative shocks, cross-sectional shocks, and discrete shocks) along with their implied volatility measures. Unlike shock measures that are computed from changes in economic variables, shock measures derived from forecasts represent the deviation of expected changes from actual changes. For example, a change in RGDP is considered a shock only to the extent that the change was unanticipated. Comparisons to alternative shock measures are shown.

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A Panel Data Approach to Economic Forecasting: The Bias-Corrected Average Forecast

Joao V. Issler, Luiz Renato Lima
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In this paper, we propose a novel approach to econometric forecasting of stationary and ergodic time series within a panel-data framework. Our key element is to employ the bias-corrected average forecast. Using panel-data sequential asymptotics we show that it is potentially superior to other techniques in several contexts. In particular, it delivers a zero-limiting mean-squared error if the number of forecasts and the number of post-sample time periods is sufficiently large. We also develop a zero-mean test for the average bias. Monte-Carlo simulations are conducted to evaluate the performance of this new technique in finite samples. An empirical exercise, based upon data from well known surveys is also presented. Overall, these results show promise for the bias-corrected average forecast.

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TS1
Contributed Session: Time Series I

Monday 9:15am-10:45am Room: Olmstead

Chair: Elliott S. Mandelman

Predicting Group Membership of Time Series using Wavelets

Ann Maharaj
Monash University, Australia

Andres Alonso
Universidad Carlos III de Madrid, Spain

Given fixed groupings of time series, a problem of great practical interest in areas such as quality control, finance and medicine, amongst others, is to predict the group membership of other time series that are not already in any of the groups. This is a discriminant analysis problem applied to time series, and several authors have tackled it using methods based in the frequency domain. We propose a method based on wavelet analysis. This will enable us to use information from both the time and frequency domains simultaneously to discriminate between time series patterns and hence predict group membership. We will consider situations where time series could be stationary, semi-stationary or non-stationary. The discrete wavelet transform (DWT) re-expresses a time series in terms of coefficients that are associated with a particular time and a particular dyadic scale. The coefficients are obtained by projecting the time series with translated and dilated versions of a wavelet filter. The coefficients of each dyadic scale are associated with different frequency bands. We will use the variances at the dyadic scales as discriminating variables. Based on group membership from training samples, classification errors can be determined to assess the performance of the method. We will use cross validation based on the hold-out-one technique to determine the classification error rate. Simulation studies will show that our method performs very well under various conditions, and applications in quality control and medicine will show that our method out-performs some of the existing methods in correctly predicting group membership.

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Estimation of Nonlinear Error Correction Models

Myung Hwan Seo
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This paper explores the asymptotic properties of the least squares estimators of nonlinear vector error correction models (VECM) that exhibits regime-specific short-run dynamics. The model is irregular due to the presence of cointegration. We make the following contributions. First, we establish the consistency of the estimator of the cointegrating vector allowing for both smooth and discontinuous transition. Second, we derive the convergence rate of the cointegrating vector estimate in the discontinuous threshold VECM. The rate is nonstandard and extremely fast, which is $n^{3/2}$. Third, we obtain the asymptotic distributions for the smoothed least squares estimators of all the model parameters in the threshold VECM. Those of the cointegrating vector and the threshold parameter is a functional of a vector Brownian motion and independent of those of the slope parameters, which are Normal. It is also shown that the smoothed estimator of the threshold is asymptotically normal as if the true cointegrating vector were known, if we plug in the unsmoothed estimator of the cointegrating vector.

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New Approach to Time Series Tracking

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In this paper we present a new approach to time series tracking using some main ideas from the paper published by Donald Michie in 1963. One of those ideas stands that is easier to learn to play many easy problems than a difficult one. Using this idea we divide the time series in small parts, which one of them will provide information of the amplitude behavior in order to ''track'' its dynamics related to the time series. i.e., this new approach generate a time series that tracks the behavior of the original one and that is what we call time series tracking. In order to test the performance of our algorithm we measure the error tracking with the metric Root Mean Squared Error (RMSE). The results indicate that with this new approach is possible to track the dynamics of a time series with high accuracy. We think that some of the applications of the time series tracking are: tracking the trajectory of airplanes, reproduce music from the known music sheet among others. Since any natural phenomena can be represented as a time series, then this approach can be applied to track any time series.

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Appropriate Adjustments to Historical Data Necessary to Provide Consistent Forecasts

Elliott S. Mandelman

Demand data, no matter the source, is replete with inconsistencies and anomalies. This is the nature of ''real world'' information. Since statistical forecasts are based on extrapolating historical patterns and trends, it is necessary, at times, to adjust historical time series so as to generate a more consistent forecast. One may need to modify the demand data resulting from a unique historical event, an outlier, in order to insure that its effects, perhaps extraordinary sales volume, are not considered when generating a projection. Similarly, when using monthly or weekly sales volume to generate a statistical forecast, one may need to normalize the historical data so that all periods are treated equally. Other adjustments to data may include the resolution of negative demand in the data stream.

This paper will present methods to identify unique events and a series of appropriate adjustments to the time series. It will also suggest ways in which to normalize period data (quarterly, monthly, or weekly) so that the basis for the statistical forecasts is consistent.

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EC2
Contributed Session: Volatility I

Monday 9:15am-10:45am Room: Herald

Chair: Rehim Kilic
Georgia Tech, USA

Volatility forecasting via threshold nonlinear models for the intra-day range

Richard Gerlach
University of Sydney, Australia

Cathy Chen, Edward Lin
Feng Chia University, Taiwan

An effective approach is presented for forecasting return volatility via threshold nonlinear heteroskedastic models of the daily asset price range. We propose a general model specification, allowing the intra-day price range to depend nonlinearly on past information or an exogenous variable such as US market information. The model captures aspects such as asymmetry and heteroskedasticity commonly observed in financial markets. We focus on parameter estimation, inference and volatility forecasting in a Bayesian framework. An MCMC sampling scheme is employed for estimation and shown to work well in simulation experiments. Finally, we compare competing nonlinear and linear range-based and popular return-based heteroskedastic models via out-of-sample forecasting performance. Applied to six international financial market indices, the range-based models are well supported by the data in terms of finding significant threshold nonlinearity, diagnostic checking and volatility forecast performance, under various volatility proxies.

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Optimal Prediction Under Asymmetric loss using Realized Volatility

Yasemin Ulu
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In this paper I analyze the loss reduction due to using the optimal predictor that incorporates time varying second order moments versus the pseudo optimal predictor which incorporates time invariant variance under asymmetric loss, using realized volatility. This enables me treat volatility ‘‘observable’’ rather than ‘‘latent’’. HAR-RV-J model developed by Andersen, Bollerslev and Diebold (2006) and ARFIMA models are used to model and forecast the daily realized volatility of DJIA computed by sum of intraday squared returns. I compare the forecast of returns from the mean predictor, pseudo-optimal predictor and optimal predictor under two common asymmetric losses; LinLin and Linex. The results suggest that even for very low degrees of asymmetry using the optimal predictor vs. the pseudo-optimal is crucial for a practitioner as well resulting in significant loss reductions.

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Does the options market provide superior volatility forecasts in the presence of microstructure noise and random jumps?

Gael M. Martin, Andrew Reidy, Jill Wright
Monash University, Australia

This paper presents a comprehensive empirical evaluation of option-implied and returns-based forecasts of volatility, in which recent developments related to the impact on measured volatility of market microstructure noise are taken into account. The paper also assesses the robustness of the performance of the option-implied forecasts to the way in which those forecasts are extracted from the option market. Using a test for superior predictive ability, model-free implied volatility, which aggregates information across the volatility 'smile', and at-the-money implied volatility, which ignores such information, are both tested as benchmark forecasts. The forecasting assessment is conducted using intraday data for three Dow Jones Industrial Average (DJIA) stocks and the S&P500 index over the 1996-2006 period, with future volatility proxied by a range of alternative noise-corrected realized measures. The results provide compelling evidence against the model-free forecast, with its poor performance linked to both the bias and excess variability that it exhibits as a forecast of actual volatility. The positive bias, in particular, is consistent with the option market factoring in a substantial premium for volatility risk. In contrast, implied volatility constructed from liquid at-the-money options is given strong support as a forecast of volatility, at least for the DJIA stocks. Neither benchmark is supported for the S&P500 index. Importantly, the qualitative results are robust to the measure used to proxy future volatility, although there is some evidence to suggest that any option-implied forecast may perform less well in forecasting the measure that excludes jump information, namely bi-power variation.

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Conditional Volatility and Distribution of Exchange Rates: GARCH and FIGARCH Models with NIG Distribution

Rehim Kilic
Georgia Tech, USA

This paper extends the Fractionally Integrated GARCH (FIGARCH) model by incorporating Normal Inverse Gaussian Distribution (NIG). The proposed model is flexible and allows one to model time-variation, long memory, fat tails as well as asymmetry and skewness in the distribution of financial returns. GARCH and FIGARCH models for daily log exchange rate returns with Normal, Student's *t* and NIG error distributions as well as GARCH/FIGARCH-in-mean models with *t* errors are estimated and compared both in terms of sample fit as well as out-of-the-sample predictive ability in several dimensions. The FIGARCH model with symmetric and asymmetric NIG errors outperform alternatives both in-sample fit and 1-day and 5-day ahead predictions of the quartiles of the exchange rate return distributions.

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H1
Panel: The US and International Health Care Crisis

Monday 9:15am-10:45am Room: Empire

Panel: The US and International Health Care Crisis: Cost Effectiveness and Quality

Chair: Paul Savage
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The health care industry in the United States is facing a huge challenge. For decades health service providers and hospitals have experienced unbounded growth, increasing their share of the GDP from less then 6% to now more the 15% of the U.S. economy. However, with an inflation rate of 60% over the past four years, neither government nor other business entities that pay for health benefits can afford to support such an expensive system along with such unrelenting cost increases.

We will briefly explore the evolution of this industry to understand the motives and incentives that have encouraged unbridled inflation for nearly three decades. We will explore the dynamics and conflict among the stakeholders, payors, patients, physicians and providers, which have mired the working relationships and resulted in sub-optimum silos of activity.

Forecasting community level needs, even in the short term, requires the insight of our most sophisticated tools. The use of simulation tools to balance the workload among the silos has only begun. However the results are too small and disjointed to be effective.

Panelists: Kevin Dayhill, Nassau-Suffolk Hospital Council, USA
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TS2
Featured Talk

Monday 11:00am-12:00pm Room: Olmstead

Chair: J. Scott Armstrong
University of Pennsylvania, USA

Forecasting, structural breaks, and non-linearities.

David Hendry
Oxford University, UK

Jennifer L. Castle, Nicholas Fawcett, James Reade
Oxford University, UK

The talk synthesizes many strands of research in Oxford into modelling and forecasting location shifts--the main source of forecast failures--which also serves as background to my co-authors' presentations. A review of predictability, its properties, and its relation to forecastability highlights the advantages of distinguishing two information sets: 'normal causal factors', and 'forces inducing shifts'. Forecast errors are evaluated in taxonomies, revealing that disaggregation over variables and time does not mitigate the impacts of breaks, nor need reduced information (of the first type) increase the impact. Next, we consider the detection of in-sample location shifts using impulse saturation techniques, which will be demonstrated 'live' using Autometrics as impulses are also important when formulating, testing for, and modelling non-linearity. Many sub-problems need solved en route, including the reduced precision of forecasts after breaks, specifically changes in collinearity, which provides a case for estimation updating. Finally, as insurance against mis-forecasting breaks, we consider combining different forecasting devices and exploiting their differential robustness to breaks, as well as differencing and intercept corrections to facilitate handling breaks. An application to UK M1 after the Banking Act of 1984 illustrates.

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David F. Hendryis Professor and Chairman of Economics Department, University of Oxford. He is a Fellow of the British Academy, the Econometric Society, the Royal Society of Edinburgh, International Institute of Forecasters, and the *Journal of Econometrics*. Dr. Hendry is a Foreign Honorary Member of the American Academy of Arts and Sciences and the American Economic Association. Modern time series econometrics and forecasting can not be defined without referring to his numerous contributions since the 1960's. Dr. Hendry's current research deals with automated general-to-specific modeling strategies in forecasting and empirical modeling

BC3
Invited Session: Central Banking

Monday 11:00am-12:00pm Room: Duffy

Chair: Javier J. Perez
European Central Bank, Germany

A Real-Time Comparison of Public and Statistical Forecasts for Inflation and Growth

Jan J. Groen, George Kapetanios, Simon Price
Bank of England, UK

It has been argued that judgemental forecasts of inflation and growth cannot be outperformed by statistical forecasting models in the (very) short-term, due to expert knowledge of the underlying data, nor the long-term, as policy makers often have superior knowledge of the structure of the economy. The goal of this paper is to seriously assess whether this indeed the case or not. We focus on the United Kingdom (UK) as well as the United States (US), and for both economies we compare public, central bank projections for inflation and economic growth to real-time forecasts that result from a range of statistical forecasting models, from autoregressive models to recursively selected data-intensive VAR models. as well as surveys. For the UK the public projections are the Bank of Englands quarterly forecasts published in the Inflation Report (IR), whereas for the US we use the Greenbook forecast as published by the Federal Reserve Board Our first pass results are: for economic growth statistical models, especially univariate autoregressive models and small-scale VAR models with monetary data, dominate the public growth projections. This is not true for the inflation forecasts, where the central bank projections dominate. The explanation for this appears to be that the official forecasts effectively incorporates information about regime changes leading to inflation mean shifts.

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Incorporating Judgement in Fan Charts

Par Osterholm
Uppsala University

Within a decision-making group, such as the monetary-policy committee of a central bank, group members often hold differing views about the future of key economic variables. Such differences of opinion can be thought of as reflecting differing sets of judgement. This paper suggests modelling each agents judgement as one scenario in a macroeconomic model. Each judgement set has a specific dynamic impact on the system, and accordingly, a particular predictive density or fan chart associated with it. A weighted linear combination of the predictive densities yields a final predictive density that correctly reflects the uncertainty perceived by the agents generating the forecast. In a model-based environment, this framework allows judgement to be incorporated into fan charts in a formalised manner.

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Fiscal forecasting with mixed frequency data: forecasting euro area government deficit

Javier J. Perez
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Diego Pedregal
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We construct short-term indicators of euro area government fiscal deficit. The indicators are based on annual, quarterly and monthly fiscal information. Annual fiscal forecasts are at the heart of European Union multilateral budgetary surveillance. Nevertheless, final annual ESA95 figures are only available with a considerable delay, and in addition, preliminary flash estimates are subject to substantial revisions. These problems are shared by recently available quarterly non-financial accounts partially disseminated by Eurostat. In this paper we built up multivariate, state-space mixed-frequencies models to integrate readily available monthly cash data with annual and quarterly general government series. By doing so, we are able to maintain the focus on forecasting and monitoring annual outcomes, while making use of intra-year fiscal information, available within the current year.

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FM2
Contributed Session: Density Methods

Monday 11:00am-12:00pm Room: Soho

Chair: Patrick E. McSharry
University of Oxford, UK

Forecasting Histogram Time Series with k-Nearest Neighbours Methods

Javier Arroyo
Complutense University, Spain

Histogram time series (HTS) can be used to describe time series where a sample of realizations of the observed variable is available for each time interval. Histograms summarize each sample in a simple but meaningful way. HTS can be applied in different fields from financial markets to demography. The adaptation of the k-Nearest Neighbour method to forecast HTS will be proposed. It requires a metric for histogram data and a method to combine histograms in order to obtain the forecasts. The forecasting performance of the proposed approach will be tested by means of a set of examples from different contexts.

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One year ahead density forecasts of oil prices

Nigel Meade
Tanaka Business School, UK

The problem of modelling and forecasting oil prices from 1990 onwards is addressed. A forecast over a one year horizon is used as the criterion as it is a useful medium term planning horizon and a density forecast over this horizon is a valuable input to risk management. Continuous time arbitrage pricing models from the literature are compared with discrete time ARMA models. Berkowitzs density forecasting test is used to assess the accuracy of density forecasts with a one year horizon. Christoffersens test is used for interval forecast accuracy. The evidence for the mean reversion process favoured by continuous time models is found to be reduced if the time series model encompasses GARCH effects and uses a non-Gaussian error term with fatter tails.

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Wind Power Density Forecasting Using Ensemble Predictions and Time Series Models

Patrick E. McSharry
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James W. Taylor
Sad Business School, UK

Roberto Buizza
European Centre for Medium-range Weather Forecasts, UK

Wind power is an increasingly used form of renewable energy. The uncertainty in wind generation is very largely due to the inherent variability in wind speed, and this needs to be understood by operators of power systems and wind farms. To assist with the management of this risk, this paper investigates methods for predicting the probability density function of generated wind power from one to 10 days ahead at five UK wind farm locations. These density forecasts provide a description of the expected future value and the associated uncertainty. We construct density forecasts from weather ensemble predictions, which are a relatively new type of weather forecast generated from atmospheric models. We also consider density forecasting from statistical time series models. The best results for wind power density prediction and point forecasting were produced by an approach that involves calibration and smoothing of the ensemble-based wind power density.

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F2
Contributed Session: Finance II

Monday 11:00am-12:00pm Room: Gotham

Chair: Joelle Liebermann
ECARES, Belgium

Managing Earnings Expectations: Persistence, Asymmetry and Predictability in Analysts' Earnings Forecasts

Marco Aiolfi
Platinum Grove Asset Management LP, USA

Marius Rodriguez
Board of Governors, USA

Allan Timmermann
UC San Diego, USA

Financial analysts' earnings forecasts are upwards biased with a bias thatgets bigger, the longer the forecast horizon. One explanation of this bias is that it reflects asymmetric costs of positive and negative forecast errors: A positive bias may facilitate better access to companies' private information but also compromises the accuracy of analysts' forecasts. This paper proposes a simple theoretical model that relates the bias and accuracy of analysts' forecasts to the forecast horizon and studies empirically its implications for the term structure of forecast errors and for persistence and predictability in analysts' earnings expectations. Using a three-state model that accounts for differences in the magnitude and persistence of positive, negative and 'no change' revisions, we find evidence that revisions to analysts' earnings expectations can be predicted using publicly available information such as lagged interest rates and past revisions. We also find that our forecasts of revisions to the consensus estimate help predict the actual earnings figure beyond the information contained in analysts' earnings expectations.

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Modeling Financial Return Dynamics by Decomposition

Nikolay Gospodinov
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Stanislav Anatolyev
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While the predictability of excess stock returns is statistically small, their sign and volatility exhibit a substantially larger degree of dependence over time. We capitalize on this observation and consider prediction of excess stock returns by decomposing the equity premium into a product of sign and absolute value components and carefully modeling the marginal predictive densities of the two parts. Then we construct the joint density of a positively valued (absolute returns) random variable and a discrete binary (sign) random variable by copula methods and discuss computation of the conditional mean predictor. Our empirical analysis of US stock return data shows, among other interesting findings, that despite the large unconditional correlation between the two multiplicative components they are conditionally very weakly dependent.

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Bond Yields Reaction to News in their Fundamentals

Joelle Liebermann
ECARES, Belgium

We analyze the daily reaction of bond yields of different maturities to a broad set of macroeconomic news releases. The motivation of this study is to gain some insight into the macroeconomic fundamentals shaping market interest rates across the yield curve. Given the forward looking nature of interest rates and efficiency of asset prices, only unanticipated macroeconomic news that cause revisions of expectations to bonds fundamentals should cause yields to change. Hence we define the news component of a release as the difference between the actual released value and its survey based forecast. We find that news releases pertaining to soft data, which are the most timely, are all highly significant for all maturities and that the size of the response in terms of the estimated coefficient are fairly uniform across maturities. The hard data are also important to markets. The employment and retail sales reports, although released after the soft data, are also significant. Hence, timeliness, conditioned upon the predictive content for GDP, is an important factor in explaining bond markets responses to news. Next, bond markets also respond significantly to some inflation measures, consumer price index and the employment cost report, which are not among the most timely. Finally, monetary policy meetings, whether followed by a change in the federal funds rate or not, also yield a significant response of bonds.

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T1
Contributed Session: Growth and Technology Diffusion

Monday 11:00am-12:00pm Room: Herald

Chair: Towhidul Islam
University of Guelph, Canada

Measuring the Impact of Security Breaches on Stock Valuations of Firms

Sanjay Goel, Christopher D. Brown, Hany Shawky
University at Albany - SUNY, USA

Information is one of the most important assets of an organization that collects or possesses sensitive data on products, customers, employees and suppliers. Digital storage and transmission of data has made information very accessible and at the same time it has rendered it vulnerable to inadvertent disclosures and malicious hackers. A series of high profile security breaches that led to disclosure of public private information prompted legislative action resulting in a spate of federal legislation for protection of public information. While companies are attempting to comply with the legislations, they are struggling to estimate their exposure to security breaches. The work assumes that investors are knowledgeable about information security and that the market responds efficiently to incidents that impact the firm. The research considers both severity and type of breach to precisely calibrate the market reaction. New York and several other states have created laws for mandatory reporting of any security breach that results in disclosure of public sensitive information. A comprehensive set of such security incidents has been obtained from the NY State government. Reports and news articles from several sources such as LexisNexis has also been collected to add to our corpus. Event study methodology is employed for our analysis and results of this analysis will be presented at the conference.

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A study on determinants of the information system adoption: An empirical analysis based on firm-level data

Minkyu Lee, Yungman Jun, Jeong-Dong Lee, Jongsu Lee
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ICT (Information Communication Technology) includes some of the wider information technology innovations and applications, and their commercialization and transfer has been quite rapid. These enhance the communication of more accurate and value-added information to workers, managers, and consumers, thus reducing uncertainty and time use in conducting many types of businesses. ICT is important and it has the potential to contribute to more rapid growth and productivity gains in the years to come. Diffusion of new technology or its adoption is at least as important to promote macroeconomic growth. Understanding the factors determining technology adoption is thus a highly relevant topic, also from the policy point of view. The paper aims at explaining empirically a firms adoption of ICT such as ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management) using a large sample of firms. Nested logit model is applied to a data set containing about 500 companies from the Korean industry in the year 2005. The explanatory variables include strategy, human capital, organization, and IT infrastructure. In addition, this analysis investigates how individual adoption can be extended to the diffusion. Finally, we can forecast the diffusion of ICT.

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Determinants, Growth Acceleration and Theoretical Drivers of Innovation Diffusion in an International and Multi-Generational Context - The Case of Cellular Mobile Phones

Towhidul Islam
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Nigel Meade
Tanaka Business School, UK

It is well known that the diffusion of technological innovation occurs at different rates in different countries. Insights into the causes of the differences in diffusion patterns are valuable. We propose a multi-country, multi-generation model to exploit the information set available for estimation using both country specific data and the countries history of adoption of the preceding generation of technology. The study addresses these questions.

1) Which economic, cultural and marketing factors explain different national rates of adoption?
2) Is there any growth acceleration?
3) What are the theoretical drivers of technology diffusion?
4) Does a multi-country, multi-generation model reduce uncertainty in decision making by providing more accurate forecasts (than simpler alternatives)?

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TS3
Invited Session: Real-Time Data 1

Monday 11:00am-12:00pm Room: Hudson

Chair: Heather L.R. Tierney
College of Charleston, USA

An Evaluation of Inflation Forecasts from Surveys Using Real-Time Data

Dean Croushore
University of Richmond, USA

This paper carries out the task of evaluating inflation forecasts from the Livingston Survey and the Survey of Professional Forecasters, using the real-time data set for macroeconomists as a source of real-time data. We examine the magnitude and patterns of revisions to the inflation rate based on the output price index and describe what data to use as actuals in evaluating forecasts. We then run tests on the forecasts from the surveys to see how good they are, using a variety of actuals. We find that much of the empirical work from 20 years ago was a misleading guide to the quality of forecasts because of unique events during the earlier sample period. Repeating that empirical work over a longer sample period shows no bias or other problems in the forecasts. The use of real-time data also matters for some key tests on some variables. If a forecaster had used the empirical results from the late 1970s and early 1980s to adjust survey forecasts of inflation, forecast errors would have increased substantially.

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Why do the Results of Rationality Tests Differ? Data Vintage, Sample Choice, and Methodological Effects

Tara M. Sinclair, H.O. Stekler, Frederick L. Joutz
George Washington University, USA

Economic forecasts have been used to test a number of important economic theories and concepts, including the efficiency and rationality of expectations. Studies that have examined the rationality of these forecasts have often reached diametrically opposite conclusions. In this paper we explore the sources of the different conclusions of three key studies that examined the rationality of the ASA/NBER forecasts of the implicit price deflator (IPD): Zarnowitz (1985), Keane and Runkle (1990), and Davies and Lahiri (1999). We focus on three substantial differences in the studies: (1) data vintage: the studies use different definitions of the ''actual'' values, (2) sample choice: the studies differ in terms of the time period examined, in terms of the forecast horizon, and in terms of forecasters surveyed, and (3) methodology: the studies use different techniques to evaluate the rationality of the forecasts. To determine why these studies disagree, we apply the different methodologies to each of the three data sets and compare the results. This analysis enables us to answer a number of important questions. Holding the sample constant, does the choice of methodology yield differing results? Holding the methodology constant, do the results differ in different samples? Does the vintage of the data that we select to represent the ''actuals'' affect the conclusions about rationality? Based on this analysis we examine the sources and their contribution to the variation in results. The goal is to understand the strength and weaknesses of the techniques used across the three key studies.

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Real Time Changes in Monetary Transmission -A Nonparametric VAR Approach

Heather L.R. Tierney
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Marcelle Chauvet
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This paper investigates the nature of changes in the US economy towards increased stability and the possibility of linkages with changes in the monetary transmission mechanism. In particular, it proposes a recursive framework in which all model parameters are time varying, not only across sub-samples, but at any point in time. This allows examination of potential structural breaks in monetary response as well as systematic changes over the business cycle. We propose a nonparametric tool to investigate local dynamic impulse response functions in a VAR system. In particular, instead of aggregating non-parametric coefficients for statistical inference, we construct local orthogonalized impulse response functions that enable analysis at each iteration of the VAR. The advantage of this tool is that it allows recursive real time analysis at each iteration of the local average effects of a shock to any given variable in the VAR system. In addition, potential nonlinearities, nonstationarities, and asymmetric behavior can be examined without the need for specifying a functional form, and information in the tail regions can be incorporated in the model. The method will be applied to real time unrevised data on inflation, nominal interest rates, and output in the U.S. In particular, the nonparametric impulse response functions will be used as tools to investigate the impact of monetary policy in the economy around periods of tight or loose monetary policy, taking into account the possibility of parameter changes across business cycle phases and due to structural changes. Furthermore, we will use counterfactual experiments to study whether the source of increased stability in the estimated nonparametric variances of nominal interest rates, inflation, and output is due to lesser impact of shocks or to changes in their propagation mechanism.

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H2
Panel: Evolving Data Needs in the Health Care Market

Monday 11:00am-12:00pm Room: Empire

Panel: Evolving Data Needs in the Health Care Market

Chair: Paul Savage
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The panelists will explore the fundamentals of accessing data resources from extremely large data repositories and the inherent limitations these resources represent. The concerns of privacy and confidentiality have been addresses by legislation placing restrictions on researchers who must know and understand the quality and limitations of the environment. The panelists will discuss the evolving management needs to employ forecasting techniques and the critical roles by analysts to draw appropriate conclusions.

Panelists: Leo K. Lichtig, NY Department of Health , USA
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Jeffrey Kraut, LIJ/North Shore Health System, USA
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BC4
Invited Session: Business Cycle Decomposition

Monday 1:00pm-2:30pm Room: Empire

Chair: Zeynep Senyuz
University of California, Riverside, USA

A Steady-State Approach to Trend/Cycle Decomposition of Regime-Switching Processes

James Morley
Washington University, USA

Jeremy Piger
University of Oregon, USA

In this paper, we present a general approach to trend/cycle decomposition of integrated time series that follow regime-switching processes. Related to one possible motivation for the Beveridge-Nelson decomposition of linear processes, we define the trend component as the steady-state level of a time series, a definition that has exploitable implications for identification of the level and variation of permanent and transitory components. We use generated data from regime-switching processes to demonstrate the advantages of the steady-state approach over alternative approaches to trend/cycle decomposition, including the long-horizon forecast used in Clarida and Taylors generalization of the Beveridge-Nelson decomposition to nonlinear processes. We then apply the steady-state approach to estimate the trend and cycle of U.S. real GDP implied by a regime-switching forecasting model that fits the data better than standard models used in trend/cycle decomposition. Our findings portray a very different picture of the business cycle than implied by more traditional methods.

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Beveridge-Nelson Decomposition with Markow Switching

Chin Nam Low
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Heather Anderson
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Ralph Snyder
Monash University, Australia

In this paper, we consider the introduction of Markov-switching (MS) processes to both the permanent and transitory components of the Beveridge-Nelson (BN) decomposition. This new class of MS models within the context of BN decomposition provides an alternative framework in the study of business cycle asymmetry. Our approach incorporates Markov switching into a single source of error state-space framework, allowing buisiness cycle asymmetries and regime switches in the long-run multiplier.

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A heteroscedasticity removing filter, with applications on the postwar U.S. business cycle

Par Stockhammar
Stockholm University, Sweden

Lars-Erik Oller
Statistics Sweden, Stockholm

This paper explores a new both simple and effective variance stabilizing filter. The filter combines moving averages and moving standard deviations, smoothed with the Hodrick-Prescott filter. The purpose of our filter is to achieve better estimates of the variance and other parameters of the process. Here the filter is used on the heteroscedastic postwar US GDP quarterly series. An adequate ARIMA-model is estimated for the filtered time series, and the parameter values are used in forecasting the original time series. The point forecasts are then compared with point forecasts from both ARIMA and ARFIMA models. The variance forecasts are also compared with those obtained from ARCH and GARCH models. We find that the point forecasts with our method are better than ARIMA and worse than ARFIMA for shorter forecast horizons, but better when the forecast horizon increases. The forecast variances are much lower with our method in comparison with ARIMA, ARFIMA, ARCH and GARCH-models. The two latter models, however, have lower forecast variances at very long horizons. Moreover the filter does not change the dynamics of white noise.

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A Multivariate Dynamic Factor Analysis of Permanent and Transitory Dynamics of U.S. Business Cycles and Stock Market

Zeynep Senyuz
University of California, Riverside, USA

This paper analyzes the permanent and transitory components of economic activity and the stock market using multivariate decompositions of trend and cycle with dynamic factor models featuring Markov switching asymmetry. Cochrane (1994) shows that both GNP and stock prices contain statistically significant transitory components. Consumption provides a natural trend for income consistent with the Permanent Income Hypothesis. Stock prices and dividends exhibit a similar relation resulting in a transitory component that can be used to determine deviations of stock market valuations from fundamentals. In this paper these two ideas are incorporated into multivariate dynamic factor Markov switching models to analyze post-war U.S. business cycles in connection with the stock market movements. For business cycles we use a multivariate model of output, consumption and investment assuming asymmetry over the business cycle phases with separate Markov-switching processes for both components. For the stock market we use a similar model in which dividends represent the stochastic trend in prices. We also allow for idiosyncratic variation in all variables to capture potential dynamics that is not explained by the common factors and test the relevance of aforementioned arguments. We find evidence of a strong relation between the permanent and transitory components of U.S. economic activity and stock market that can be exploited for forecasting business cycles.

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BC5
Contributed Session: Exchange Rates II

Monday 1:00pm-2:30pm Room: Duffy

Chair: Hong-Jen Lin
Nyack College and Alliance Theological Seminary, USA

Forecasting exchange rates using a novel Artificial Neural Network approach

Juan-Angel Jimenez-Martin, Maximiliano Marinucci,
Complutense University, Spain

In this paper we use a novel modeling technique called RETINET (RElevant Transformations of the Inputs NETwork) to investigate the predictability of the \$/£ and \$/yen exchange rates using weekly time series. The method is related to Artificial Neural Networks techniques and is based on earlier works of Perez-Amaral, Gallo and White (2003), White (2006), and Marinucci (2007). It represents a unique approach to functional approximation of an unknown conditional mean function, which uses a general specification of the form $\mu(X)= X'\alpha + \Psi(X,\gamma)'\beta$. The $X'\alpha$ term represents the linear component, while $\Psi(X,\gamma)'\beta$ represents a single layer feed-forward neural network with Ψ that may be chosen from library of different activation functions. In our formulation the hidden parameters γ don't need to be estimated in virtue of some powerful results due to Stinchcombe and White (2000) on miss-specification testing. It follows that the above parameterization is linear in the parameters and thus avoids the computational burden related to non-linear optimization of the coefficients. Moreover, the presence of the linear component X' allows us to retain certain degree of interpretability of the suggested parameterization that is not possible using traditional ANN's black boxes. To avoid the dangers of over-parameterization, the method performs an automated search using a cross-validatory strategy. The results obtained by applying our methodology are compared with previous works in the literature on exchange rate forecasting and have significantly lower out-of-sample mean square error relative to the random walk model.

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Forecasting exchange rate volatility: A comparison of Neural Networks and Artificial Immune System

Jingyi Liu, Angelica Gonzalez
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A variety of techniques have been developed to forecast exchange rate volatility. Most fall into statistical techniques. Some are based on techniques associated with signal processing and spectrum analysis. Some that are new are inspired by the learning mechanism of the evolutionary computation.

Neural Networks (NN) is a competitive tool for forecasting. The Artificial Immune System (AIS) has a number of characteristics that make it a suitable metaphor for forecasting. Artificial Immunisation Algorithm (AIA) is a new optimisation method based on the biologic immune principle of human being and other living beings. It can effectively avoid the premature convergence and guarantees the variety of solution.

The paper conducts an empirical study in the performance of Back-Propagation Neural Network (BPNN) and Immunisation Algorithm of Immune System (IAIS) in forecasting monthly realized volatility of USD/GBP exchange rate. The realized volatility is constructed from the daily log returns. Out-of-sample forecasts are evaluated by several criteria. The findings indicate that for weak noisy data BPNN works well while dynamic antigenic IAIS has better forecasting performance basing upon strong noisy data. Both algorithms dont show good out-of-sample forecasts for multi-step-ahead horizons. Our empirical results give further implications for option pricing as well as policy making.

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The Predictability of Exchange Rate Volatility

Burkhard Raunig
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The model-free test procedure used in this paper suggests that exchange rate volatility is hard to predict more than one month ahead with time series methods. Moreover, predictability declines rather quickly with horizon.

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Nonlinear SUR vs. Nonlinear OLS in forecasting foreign exchange rates: a case of dynamic speed of adjustment

Hong-Jen Lin
Nyack College and Alliance Theological Seminary, USA

SUR has long been proved more efficient estimation methdology than OLS and its performance in forecasting assessment is usually better. However, this relationship may not hold in their nonlinear counterparts in the forecasting of currency. The empirical results of a dynamic speed of adjustment specification show that the nonlinear OLS outperforms nonlinear SUR. This different outcome may be caused by the spill-over effect, contagious effect,and other economic shocks. These effects disturb the covariances among currencies and distort the estimators. In other words, nonlinear SUR perform well only when the exchnage rates and other ecnomic factors are cointegrated.

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EC3
Contributed Session: Forecast Accuracy

Monday 1:00pm-2:30pm Room: Hudson

Chair: Hai (David) Guo
Georgia State University, USA

Forecasting Accuracy: A Review of the Literature

Edward M. Cupoli
University at Albany, SUNY, USA

The paper presented, Forecasting Accuracy, examines economic and budget forecasting accuracy in the United States at the federal and state levels, with special attention to New York State. The major questions to be answered are: (1) how accurate are the forecasts; and (2) do the forecasts tend to err in any one direction?

The findings suggest a cyclical bias; that is, forecasters tend to be low (under-forecast) when the economy is expanding and high (over-forecast) when the economy is faltering. Since the economy typically is in expansion longer than in contraction, forecasts tend to be low more often than they tend to be high.

The primary focus is on economic forecasts and their accuracy. The economy drives most receipts whether for government or business. The economy also plays a major role in determining the needs and wants of the people. Generally, the economy is a good predictor of general budget forecasting accuracy. Since receipts and disbursements are driven in large part by demographics and economics, the ability to provide accurate economic forecasts is the major determinant of accurate budget forecasts, especially in the short term.

While revenue and expenditure forecasts should be the measure of budget forecasting accuracy, most researchers do not compare actual revenues with those that were originally forecast. For example, New York States recent Executive Budget included an assessment of the accuracy of the States revenue forecasts, but rather than comparing actual tax receipts with those forecast in the original Executive Budgets, the report compared actual receipts with those forecast in the Enacted Budgets. Since the Enacted Budgets were based on more up-to-date information than the Executive Budgets, the observed error rates were probably understated. Nonetheless, the assessment found that tax revenues were under-forecast in nine of the past eleven years and that the under-forecast error ranged from less than 2 percent to more than 6 percent. These numbers may seem small, yet based on projected tax revenues of $61 billion in State fiscal year 2007-08, the error would be in the range of $1.2 to $3.7 billion.

The report concludes with a recommendation for a national institution to create a repository to track state-level forecasts similar to that which tracks national-level forecasts. This would provide more feedback to states and improve their economic and revenue forecasting.

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Optimality Tests for Multi-Horizon Forecasts

Carlos Capistran
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This paper develops a test to evaluate the optimality of forecasts when forecasts for more than one horizon are available. The test is based on the property that the unconditional expected loss of optimal forecasts should not decrease with the forecast horizon (e.g., under quadratic loss the variance of optimal forecast errors should not decrease with the horizon). The test complements existing methods of forecast evaluation by using an implication of optimality that directly concerns forecasts made at different horizons. The finite sample performance of the test is analyzed through Monte Carlo simulations. An application using inflation forecasts from Consensus Economics is provided.

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How well do the Market-Moving Indicators Predict Turning Points in U.S. Economic Growth?

Anirvan Banerji
ECRI, USA

Paul Samuelson once joked that the stock market has predicted nine out of the last five recessions. While he was right that stock prices are over-sensitive leading indicators of the business cycle, what many do not know is that stock prices are a good leading indicator of cyclical turning points in economic growth.

Of course, the financial markets get their information from a plethora of sources. However, some of the most important are the "market-moving" indicators released regularly by government and private sources.

In the late 1990s, the New York Fed determined 16 such market moving indicators that were significant in their impact on prices, bid-ask spreads and volume of five-year U.S. treasury notes in the minutes after their release. They can therefore be taken as a definitive list of such market-moving indicators, especially because both equities and fixed income markets tend to be affected simultaneously by such data releases.

We grade each of the 16 indicators on criteria such as average lead at turning points, variability of leads, noise and promptness of availability. While many of the indicators perform fairly well on many of the criteria, the key finding is a surprise, given the common belief that the stock market is forward-looking. Specifically, we find that in terms of leads at turning points, most of these market-moving indicators are coincident or lagging indicators of economic growth.

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Institutional Structure and the Accuracy of State Revenue Forecasting

Hai (David) Guo, Katherine Willoughby
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Given the revenue-driven quality of state budgets, the accuracy of revenue forecasts is a key factor in accomplishing budget goals. Especially during periods of fiscal decline, accurate revenue estimates can help states maintain budgetary equilibrium. Further, research indicates that conservative estimates, those closer to underestimates than overestimates, can help states to deal more effectively with the uncertainties of tax collections Revenue forecasting is a complex process to a state government and the institutional structure affects the accuracy of the forecasts. Institutional structures include budget constraints such as balanced budget requirements, tax and expenditure limitations, and supermajority voting requirements.

The 2005 Government Performance Project (GPP) examined state practices related to the engagement of a multi-year budgeting perspective, with standards for this criterion including forecasting methods and accuracy. Using the GPP survey data, this paper examines the impact of institutional structures on the accuracy of state governments revenue forecasting and how institutional structures of a state government influence its tendency of conducting conservative revenue forecasting. The greater the accuracy of revenue forecasts the stronger the ability of states to support a multi-year budgeting perspective, and to be prepared for periods of fiscal surplus as well as inevitable decline.

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F3
Contributed Session: Finance III

Monday 1:00pm-2:30pm Room: Gotham

Chair: John Guerard
McKinley Capital Management, Inc., USA

Forecasting: Marketing Segmentation to New Financial Services Products

Kenneth D. Lawrence
New Jersey Institute of Technology, USA

Dinesh Pai
Rutgers University, USA

The paper focuses on the development of a forecast of customers for a financial services product. This segmented forecast is based on the utilization level of the new financial services product. The technique being employed in the segmented forecasting process is a multi-criteria mathematical programming formulation for the discriminant model and for the clustering by observations process. The effectiveness of the forecasting process is evaluated by determining results from an evaluation set of data.

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Analyzing Corporate Dividend Policy using Neural Nets

Owen P. Hall, Jr., Samuel Seaman
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Investigations of the factors that drive corporate dividend and/or repurchase policies continue to attract the attention of business professionals and academics alike. Presently there is no consensus about exactly which factors lead to a firms' decision to issue dividends or repurchase shares. There are, of course, a number of theories attempting to explain dividend/repurchase policy, most of which cite management's interest in signaling the market place with regards to the firm's financial viability and strong growth potential. A number of studies have looked at dividend policy using standard statistical models to predict dividend payout and/or share repurchase based upon a variety of financial factors. What has not yet been investigated, fully, is the comparative performance of neural networks with the usual statistical models. The purpose of this presentation is to compare and contrast the predictive capabilities of neural networks, logistic regression, and discrimination techniques when they are applied to the analysis of corporate dividend/repurchase policy.

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Semi-parametric Density Expansions: Orthogonality vs Simplicity

Trino-Manuel Niguez
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Javier Perote
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In this paper we introduce a family of densities based on a new type of expansions that we name General Moments Expansions. We argue that our approach presents theoretical advantages over Edgeworth and Charlier type of expansions, which are related to, on the one hand, the simplicity of their polynomials (i.e. the orthogonality property is not required yet), and on the other hand, their generality, since they can easily be applied to any distribution with finite moments up to the polynomial truncation order. We illustrate the usefulness of the proposed densities through an out-of-sample forecasting exercise for exchange-rate returns risk. Our results show that the proposed model provides fairly accurate volatility and VaR forecasts in comparison the ones obtained from the VaR procedure proposed in Engle (2001) and a GARCH model with Student's t errors.

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Stock Selection in Global Markets: Applying the Markowitz-Xu Data Mining Corrections Tests

John Guerard, Sundaram Chettiappan
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The purpose of this study is to present empirical evidence that stock selection models for US, Developed, and Global markets are similar in performance for the 1995-2006 period. We apply the Markowitz-Xu Data Mining Corrections (DMC) to the three universes for a series of 30 models using fundamental, momentum and earnings forecasts-derived variables. We find statistically significant models in all three universes that allow us to reject the null hypotheses of data mining. The data mining corrections coefficients are similar in the three universes. There are significant differences in the strength of the earnings forecasts variables in the universes and statistical support for the expansion of US investors into global portfolios.

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FM3
Panel: How Dirty Data Impacts Forecasting

Monday 1:00pm-2:30pm Room: Chelsea

Panel Discussion: How Dirty Data Impacts Forecasting

Chair: Leon Schwartz
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Although professional forecasters today have easy access to more data than ever before, the data itself tends to be dirty and less reliable. Our expert panel of practitioners will address the impact of poor data quality on their forecasts across multiple industries. They will share with the audience their personal horror stories of how poor data can wreck even the most sophisticated forecasts. They will also offer some advice as to how to overcome the limitations of many data sources in our world of data abundance.

Panelists: Joan Coprio, Pitney Bowes, USA
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FM4
Contributed Session: Model Specification I

Monday 1:00pm-2:30pm Room: Soho

Chair: Brendan McCabe
University of Liverpool, UK

Psychonometrics: Incorporating psychological variables into econometric analyses

Fergus Bolger
Durham Business School, UK

In time-series econometrics, regression models are developed in order to understand how important economic variables covary over time this has obvious implications for forecasting the future behaviour of those variables, particularly where some variables might be easier to obtain than others, or act as leading indicators of others. Usually, the variables examined in econometric analysis are objective economic indicators such as unemployment, inflation, and GDP. In this paper I propose to extend time-series econometric models to include psychological variables like consumer confidence, perceptions of economic quantities such as prices, and emotional responses to salient news events. I refer to such analyses as ''psychonometrics''.

Analysis of the influence of news events presents a particular challenge to psychonometrics. Events considered significant must be coded in some way and the simplest way of doing this is to code selected events as a set of dummy variables. However, the dummy-variable approach suffers from the weakness that it is not sufficiently sensitive to permit predictions that discriminate between events that have a positive or a negative influence on, for example, mood, expectations, and consumption. Moreover, for k events, k-1 dummy variables are required. But the major events of, for instance, the past 20 years that might conceivably have influenced public sentiment generate a very large number of dummy variables in the model relative to the number of observations per variable. This causes overfitting of the model. My solution to these problems is to create indices of event significance either by using some metric such as the number of mentions in the media or by getting independent judges to select and/or retrospectively rate the events to be used along various dimensions.

I give two specific examples of the psychonometric approach using event indices and discuss implications for economic forecasting.

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Input variable selection for time series forecasting with artificial neural networks - an empirical evaluation

Nikolaos Kourentzes, Sven Crone
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Artificial neural networks have been successfully applied in several time series forecasting applications. However, they are not yet an established method in forecasting practice. Previous research suggests that the identification of an adequate lag structure for the input nodes has a preeminent impact on forecasting accuracy and robustness. While various approaches to identify linear dependencies of input variables exist in statistics, no systematic evaluation on nonlinear NN has been conducted. This study evaluates three approaches to selecting the input vector of neural networks for time series forecasting: (1) autocorrelation and partial autocorrelation analysis of ARIMA modelling, (2) spectral analysis and (3) a naive approach corresponding to the length of the seasonality, resulting in long lag structures. We evaluate different multilayer perceptrons architectures on 36 artificial synthetic time series that combine linear, exponential or dampening trend with additive or multiplicative seasonality for three different levels of Gaussian noise. The robustness and accuracy of each input variable selection approach is evaluated under the different conditions of single and multiple step ahead forecasting and compared to established ARIMA and exponential smoothing models.

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Extending the Information Used by Method Selection Techniques

Richard Lawton
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One of the most important issues in exponential smoothing is the question of selecting a suitable smoothing method. One of the most common approaches is to use one of the information criteria. There are several of these, including the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The common feature of these criteria is that they select a model based on a goodness of fit measure along with a penalty function based on the number of parameters used.

The goodness of fit measure used is based on the mean of the squares of errors, which are taken as one step ahead forecast errors. This seems to lose information that is potentially useful in the selection process in that, whilst a method may manage to keep up with the level of a series, the nature of the forecast function is often the clearest factor which differentiates between the possible different methods. This paper investigates the benefit of including such information in the selection process. The focus will be on the main non-seasonal exponential smoothing methods, namely simple exponential smoothing, damped Holts method and Holts method.

It is striking that, whilst the difference between forecast accuracy and bias is one of the first things that we teach new students of forecasting, the idea of bias is not used to try to choose between the different methods. This paper also reports on the contribution that information about bias, at a series of forecast horizons, can make to the problem of method selection.

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Model Selection, Estimation and Forecasting in INAR(p) Models

Brendan McCabe, Rui Bu
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This paper considers model selection, estimation and forecasting for a class of integer autoregressive models suitable for use when analysing time series count data. Any number of lags may be entertained and estimation may be performed by likelihood methods. Model selection is enhanced by the use of new residual processes that are defined for each of the p+1 unobserved components of the model. Forecasts are produced by treating the model as a Markov Chain and estimation error is accounted for by providing confidence intervals for the probabilities of each member of the support of the count data variable. Confidence intervals are also available for more complicated event forecasts such as functions of the cumulative distribution function; for example, for probabilities that the future count will exceed a given threshold. A data set of Australian counts on medical injuries is analysed in detail.

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TS4
Contributed Session: Nonstationarity

Monday 1:00pm-2:30pm Room: Olmstead

Chair: P. Geoffrey Allen
University of Massachusetts, USA

Long memory and nonstationarity in human motor control models

Nuno Crato
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Ana Diniz, Joao Barreiros
N. M. Matematicos FMH, Portugal

The Wing-Kristofferson model offers a decomposition of inter-response intervals in tapping tasks based on a cognitive component and on a motor component. We suggest a new theoretical approach in which the cognitive component is modeled as a long-memory process and the motor component is treated as an independent white noise process. We contrast this model with a switching trend model. We obtain the corresponding autocorrelation and the spectral density functions. We estimate both models with empirical data and compare the corresponding forecasts with the observations.

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Adaptive forecasting method for nonstationary time series

Dumitru Iulian Nastac
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Emilian Dobrescu, Elena Pelinescu
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The paper advances an original artificial intelligence-based mechanism for specific economic predictions. The time series under discussion are inherently nonstationary. This aspect implies that the distribution of the time series changes over time. The recent data points could provide more important information than the far distant data points. Therefore, we propose a new adaptive retraining mechanism to take this characteristic into account. The algorithm establishes how a viable structure of an artificial neural network (ANN) at a previous moment of time could be retrained in an efficient manner, in order to support modifications in a complex input-output function of a financial forecasting system. In this system all inputs and outputs vary dynamically, and different time-delays might occur. A ‘‘remembering process’’ for the former knowledge achieved in the previous learning phase is used to enhance the accuracy of the predictions. The results show that the first training (which includes the searching phase for the optimal architecture) always takes a relatively long time, but then the system can be very easily retrained, as there are no changes in the structure. The advantage of the retraining procedure is that some relevant aspects are preserved (‘‘remembered’’) not only from the immediate previous training phase, but also from the previous but one phase, and so on. A kind of "slow forgetting process" also occurs; thus it is much easier for the ANN to remember specific aspects of the previous training instead of the first training.

The experiments reveal the high importance of the retraining phase as an upgrading/updating process and the effect of ignoring it, as well. There has been a decrease in the test error when successive retraining phases were performed and the neural model accumulated experience.

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Testing for a unit root when uncertain about the trend

David Harvey, Steve Leybourne, Robert Taylor
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In this paper we consider the issue of testing for a unit root when it is uncertain as to whether or not a linear deterministic trend is present in the data. The Dickey-Fuller-type tests of Elliott, Rothenberg and Stock (1996), based on (local) GLS detrended (demeaned) data, are near asymptotically efficient when a deterministic trend is (is not) present in the data generating process. We consider a variety of strategies which aim to select the demeaned variant when a trend is not present and the detrended variant otherwise. Asymptotic and finite sample evidence demonstrates that some sophisticated strategies which involve auxiliary methods of trend detection are generally outperformed by a simple decision rule of rejecting the unit root null whenever either the GLS demeaned or GLS detrended Dickey-Fuller-type tests reject. We show that this simple strategy is asymptotically identical to a sequential testing strategy proposed by Ayat and Burridge (2000). Moreover, our results make it clear that any other unit root testing strategy, however elaborate, can at best only offer a rather modest improvement over the simple one.

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Refining the unit root test

P. Geoffrey Allen
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Robert Fildes
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Testing for unit roots has been a popular activity among econometric forecasters and where systems of equations are used so has cointegration testing. Many questions remain about whether such testing is useful, and if so, when in model development it should occur. For more than a one-step-ahead forecast, a system of equations is almost always required. In the context of a general-to-specific model selection strategy, the possibilities are: (1) Start with a VAR in levels (either in standard form or in unrestricted general error-correction form) and reduce each equation to its most acceptable parsimonious form, (2) Test simultaneously for lag order and rank of the parameter matrix and impose those restrictions at the start, or (3) Test and impose cointegration and common cycle restrictions after the reduction described in (1). Not considered is the possibility of imposing cointegration restrictions suggested by economic theory. We report some preliminary results of a Monte Carlo study that compares the forecast performance of the three strategies.

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O1
Contributed Session: Presidential Election I

Monday 1:00pm-2:30pm Room: Gramercy

Chair: Christopher Wlezien
Temple University, USA

The Time for Change Model and the 2008 Presidential Election

Alan I. Abramowitz
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This paper will use the time for change model, which has correctly predicted the popular vote winner in the last four presidential elections with an average margin of error of less than 2 percentage points, to examine the outlook for the 2008 presidential election and to make conditional forecasts of the outcome of that contest. According to the model, 2008 will be a time for change election since the Republican Party will have held the presidency for eight years, making it much more difficult for the incumbent party to maintain its hold on the White House. Moreover, given the likely values of the other two predictors in the model, real GDP growth and net presidential approval, the model suggests that a change in party control of the White House is highly likely in 2008 regardless of the identities of the major party nominees. According to the time for change model, no matter whom the Democrats and Republicans nominate in 2008, the election will be a referendum on the Bush presidency. Given this fact, unless there is a dramatic improvement in George Bush's approval rating in the next 18 months, it is very unlikely that any Republican candidate can win.

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Evaluating U.S. Presidential Election Forecasts and Forecasting Equations

James E. Campbell
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Like all forecasting, election forecasting has been the object of a good deal of criticism. Some of the criticism has been fair, but a good deal of it has been unfair. To the extent that forecasts are accurate, critics claim the forecast was obvious. To the extent it was inaccurate, critics claim the forecast was voodoo political science. While critics must be suffered in any line of endeavor, their criticism may be more stinging (and sometimes justified) when the forecasting enterprise lacks reasonable standards by which specific forecasts and the equations they are derived from are composed, reported, and judged. The purpose of this paper is to propose and assess various standards for composing, reporting, and judging forecasts and forecasting equations of U.S. presidential elections. The purpose is to help in the advancement of election forecasting as a field by suggesting some common standards of equation.

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Forecasting Tests: the 2008 Presidential Election

Charles Tien
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Michael Lewis-Beck
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Presidential forecasting models with a strong theoretical grounding will stand up better over time. Our paper reviews various voting theories and applies them to forecasting models for empirical testing. For example, recent research (Lewis-Beck and Nadeau 2001) finds that voters are more prospective when no incumbent is running and more retrospective when the incumbent is running. Most forecast models have not incorporated this theoretical development. We attempt to solve this prospective problem in presidential forecasting by testing different specifications of it in different models. We also explore other ideas such as income inequality, job growth, opponent popularity and party identification in forecasting the 2008 election.

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The Economy and the Presidential Vote: What Leading Indicators Reveal Well in Advance

Christopher Wlezien
Temple University, USA

Everybody knows that ‘‘the economy’’ matters in presidential elections, but how can one incorporate economic information in an early forecasting equation? Our economic forecasting tool is the cumulative growth of leading indicators-weighing recent growth most heavily-which provides an early warning, as early as quarter 1 of the election year, about the Election Day economy. Our model also includes presidential approval to control for noneconomic factors. In this paper we show how cumulative leading indicators measured early in the election year actually reveal as much about the final vote as cumulative income growth observed on the eve of the election. That is, voters respond far more to economic change that is predicted well in advance of elections than to late economic surprises that are felt but not yet recorded in terms of public economic statistics. The finding is suggestive about how the economy matters, and has clear implications for our ability to forecast the outcome early in the election year. These are considered in a concluding section.

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FM5
Contributed Session: State Space Models

Monday 1:00pm-2:30pm Room: Herald

Chair: Yorghos Tripodis
University of Massachusetts, USA

State space model for aggregated longitudinal data

Marek Brabec, Ondrej Konar, Marek Maly, Emil Pelikan, Jiri Vondracek
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We will present a statistical model for population of individual trajectories. It can be viewed as a (nonlinear) regression model with random effects (NLME) - where the regression is done on time and possibly other covariates. Rather unusual here is that we propose a rich structure of random effects describing within-individual variability. It is given by a (nonlinear) state-space model (SSM) specification - where structural parameters are shared by all population members. Initial values are generated from a common population distribution. Richness of the random part would bring large computational burden if standard NLME computations were used. Instead, we base maximum likelihood estimation of structural and regression parameters on prediction error decomposition achieved by (extended) Kalman filtering. The approach can be relatively easily adapted for irregular and otherwise complicated observation settings. We will focus on particular aggregation-related obstacle, which is of particular interest in applications we have on mind. Models real-world performance will be illustrated on individual gas consumption data. They typically are (noisy) observations of underlying consumption process integrals over intervals whose length varies both in time and across individuals. We extend a model that has been in use in Czech gas industry. While the original model conveniently decomposes individual specific (but constant) and time-varying (but common for all population members) multiplicative parts, the SSM extension allows for semiparametric modeling of time*individual interaction known to be present in real data. Besides demonstrating extended models performance in comparison with the fully multiplicative model, we will explain how the SSM-based extension can be useful for important practical tasks connected with interpolation needed e.g. when estimating average consumption across individual customers and time interval which is different than intervals from which individual time-integrated consumption observations are available. The work is supported by the Grant Agency of the AS CR, grant No. 1ET400300513.

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Modelling and forecasting large sets of time series by subspace methods

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The engineering literature provides efficient methods to model and forecast a large set of (single or multiple) time series with a low cost in terms of analyst and computer time. The basic decision required by these procedures consists of determining the minimal system order required to represent the data. When applied to economic data, existing algorithms have three main shortcomings: i) some of them have a poor performance in short samples, ii) most of them are not robust and iii) none of them can accommodate seasonality. We tackle the first two issues by proposing new and refined criteria. The third one is dealt with by decomposing the system into its regular and seasonal subsystems. The performance of all these procedures is analyzed through Monte Carlo simulations and illustrated with some real cases.

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Forecasting wind energy through time-varying parameter models

M. Poncela, P. Poncela
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Wind energy is clean, the primary energy (wind) is zero cost and it has low operating and maintenance costs. In spite of these advantages, there is a main drawback to produce it: it is hard to control and regulate. To minimize these disadvantages, we need to have forecasts of wind power as accurate as possible.

In this paper, we use time varying parameter models in order to produce 1 to 36 hours ahead forecasts of wind power. We set up the models in state space form and estimate them by maximum likelihood through the EM algorithm and the Kalman filter and smoother. We will include not only univariate specifications for the time varying models but multivariate models as well. Finally, we will introduce weather variables and a new variable in the model that summarizes the characteristics of the wind farm in order to improve the forecasting performance of the models.

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Forecasting in linear autoregressive models with heteroscedastic measurement error

Yorghos Tripodis
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We consider heteroscedastic measurement error models within the time series unobserved component framework. A variable of interest is observed with some measurement error with non-constant variance and modelled as an unobserved component. This is a common case in ecological time series where the sampling effort is time dependent causing a non-constant variance in the measurement error. We are interested in forecasting the unobserved variable of interest. Assuming that the model for heteroscedasticity has been modelled correctly the Kalman filter calculates the best linear predictors for the underlying variable given the observed series. We propose an additional step which gives better forecasts, in the RMSE sense, for the underlying variable. We consider different linear predictors for the underlying variable given the observations which they are subjected to a transformation. For example if we weight the observations by their non-constant variance, the new linear predictor for the underlying variable will be better than without weighting. This is true even if we know the exact form of heteroscedasticity in the measurement error. This procedure is not appropriate if we are interested in the predictor of the observed process which includes the measurement error. In this case the unweighed observations give the best predictor. We also consider the variance of the one-step ahead prediction error of the underlying variable which now depends on the estimated variance of the measurement error.

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K2
Plenary Session

Monday 2:30pm-3:30pm Room: Astor Ballroom

Chair: Lars-Erik Oller
Statistics Sweeden, Stockholm

Forecasting Economic and Financial Variables in the Presence of Model and Estimation Window Uncertainties: Forecasting with Global VARs

M. Hashem Pesaran, Vanessa Smith
Cambridge University, UK

Macroeconomic policy analysis and risk management require taking account of the increasing interdependencies that exist across markets and countries. This invariably means that many different channels of transmissions must be taken into account. We are presented with the task of modeling complex high dimensional systems. There are major differences in cross country correlation of output growths, inflation, and interest rates. Equity returns and long term interest rates are much more closely correlated across countries as compared to output growth and inflation.

The Global Vector Autoregressive (GVAR) model is introduced in Pesaran, Schuermann and Weiner (2004, *JBES*) and further developed in Dees, de Mauro, Pesaran and Smith, DdPS, (2007, *JAE*) for the empirical analysis of global interactions. The GVAR approach models the interlinkages using trade-weighted observable macroeconomic aggregates and financial variables. It allows for inter-dependence at a variety of levels in a transparent manner that can be empirically evaluated and have long-run relationships consistent with the theory and short run relationships consistent with the data.

In this paper the GVAR model estimated over the 1979q1-2003q4 period by DdSP is used to generate out of sample one quarter and four quarters ahead quarterly forecasts of real output, inflation and interest rates across 26 countries over the period 2004q1-2005q4. The forecasts are compared with univariate autoregressive and random walk models. Following the theoretical contributions of Pesaran and Timmermann (2007, *JoE*), the effects of model and estimation uncertainty on forecast outcomes are examined by pooling of forecasts obtained from different GVAR models estimated over alternative estimation periods.

Professor M. Hashem Pesaran received his BSc in Economics at the University of Salford (England) and his PhD in Economics at Cambridge University. Currently, Dr Pesaran is Professor of Economics at Cambridge University and a Professorial Fellow of Trinity College, Cambridge.

He is a Fellow of the British Academy, of the Econometric Society, and of the Journal of Econometrics. He is the recipient of the 1990 George Sell Prize from The Institute of Petroleum, London, the 1992 Royal Economic Society Prize for the best article published in The Economic Journal for the years 1990 and 1991, and the joint recipient of the Econometric Reviews Best Paper Award 2002-2004 for his paper on Long Run Structural Modeling.

Dr. Pesaran is the founding editor of the *Journal of Applied Econometrics*, and a co-developer of *Microfit*, an econometric software package published by Oxford University Press.

He has over 130 publications in leading scientific journals in the areas of econometrics, empirical macroeconomics and the Iranian economy, and is an expert in the economics of oil and the Middle East.

F4
Featured Speaker
International Journal of Forecasting Editors'Invited Lecture

Monday 3:45pm-4:45pm Room: Gotham

Chair: Rob Hyndman
Monash University, Australia

Elusive return predictability

Allan Timmerman
University of California San Diego, USA

We discuss predictability of returns on risky assets in financial markets when the underlying data generating process is constantly evolving and return forecasting models at best can hope to uncover evidence of 'local' predictability. Our discussion is illustrated using a suite of models to predict US stock returns. Most of the time the forecasting models perform rather poorly, but there appears to be relatively short-lived episodes with return predictability. The relatively short duration of the episodes where return predictability appears to be present and the relatively weak degree of predictability even during such periods makes predicting return an extraordinarily challenging task.

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Comments: **Stephen Brown** New York University, USA
David Hendry, Oxford University, UK

Alan Timmerman (Ph.D. 1992, Cambridge) is Professor of Economics at the University of California at San Diego. A prolific researcher in finance and econometrics, he has published over sixty articles during last 15 years. A past departmental editor of *Journal of Forecasting*, Professor Timmermann is currently on the editorial boards of *Journal of Business and Economics Statistics*, *Journal of Economic Dynamics and Control*, *Journal of Financial Econometrics*, *Annals of Finance* and *Journal of Asset Management*.

BC6
Invited Session: Equilibrium Growth and Cycles

Monday 3:45pm-5:15pm Room: Hudson

Chair: George Monokroussos
SUNY, Albany

Brazilian Economy: Different Paths under Distinct Macroeconomic Scenarios in a Simple General Equilibrium Model with Price Rigidity

Joaquim Andrade, Fabiano Bastos
Universidade de Brasilia, Brazil

Dynamic stochastic general equilibrium (DSGE) models have gained increased importance amongst policymaking institutions as they provide a theoretical framework for constructing short/medium run scenarios for key macroeconomic variables. Building on this literature, the paper proposes a DSGE model for the Brazilian economy in which long-run growth is discussed alongside the issue of fiscal and monetary policy coordination. The model generates scenarios for the Brazilian economy upon the choice of alternative macroeconomic policies.

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RBC Models at Forecasting

David De Antonio Liedo
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Real Business Cycle (RBC) models provide parsimonious representations of the data which impose restrictions in the rank of the covariance matrix of the observables and in the rank of the spectral density. Beyond those restrictions, which are typical from models with a factor analytical structure, additional restrictions on the causal relationships between the variables are given by the utility and production functions embedded in the model economy. An illustration will be used to understand the extent to which RBC models can be used at forecasting and argue that the rank reduction constrains in the second order moments of the data are more useful at forecasting than the general equilibrium effects. The Model Confidence Set testing technology of Hansen et al.(2005) is used in the analysis.

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A Small-Scale Estimated DSGE Model for Forecasting the South African Economy

Rangan Gupta, Dave Liu
University of Pretoria, South Africa

This paper develops an estimable hybrid model that combines the microfounded DSGE model with the flexibility of the atheoretical VAR model. The model is estimated via the maximum likelihood technique, based on quarterly data on real Gross Domestic Product (GDP), consumption, investment and labour hours, for the South African economy, over the period of 1970:1 to 2005:4. The out-of-sample forecasts from the hybrid model are then compared with the forecasts generated from the Classical and Bayesian variants of the VAR and the VECM, based on a recursive estimation using the Kalman filter algorithm, for the period 2001Q1-2005Q4.

The results obtained, indicate that the estimated hybrid DSGE model outperforms both the Classical and Bayesian VARs and VECMs in terms of out-of-sample forecasting performances. In addition to the superior forecasting abilities of the DSGE model, the same is also capable of explaining the movements in the chosen macroeconomic variables of the South African economy. Thus, the DSGE model developed here, which simultaneously exploits the power of detailed economic theory but is flexible enough to be taken to the data, is well equipped to explain movements in the real data, both within- and out-of-sample.

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A Bayesian Investigation of Cross-Country Growth and Convergence Empirics

George Monokroussos
SUNY Albany, USA

This paper revisits the question of countries' per capita income convergence using a Bayesian estimation approach, which allows both for a more informative depiction of the empirical results and of their implications, and for a more flexible framework for testing competing hypotheses than those of existing approaches (such as classical cross-section, panel, or distribution dynamics techniques). A ''scenario analysis'' is conducted, whereby priors with differing implications for the convergence hypothesis are employed; in contrast to earlier Bayesian papers (such as Canova and Marcet (1995)) this paper uses MCMC estimation methods, thereby eschewing the need to impose restrictive assumptions and priors. The results are contrasted with those of the existing convergence literature.

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FM6
Contributed Session: Comarisons of Forecasting Methods I

Monday 3:45pm-5:15pm Room: Herald

Chair: Michele Hibon
INSEAD, France

Kernel Density Areas versus Spatial Disaggregation: A Comparison of Two Spatio-Temporal Crime Forecasting Approaches

Hasan Al-Madfai, Andrew Ware, Christian Ivaha
University of Glamorgan, UK

There has been rapid progress in the theory and application of crime modelling and forecasting in the past decade. However, for a given type of crime, the basic questions that these applications aim to answer remain more or less unchanged: ''how many'' crimes are expected to take place? And, ''where'' will these crimes take place? From a practical point of view, an informative crime modelling application is one that provides the answers to both questions concurrently. Such application can also act as an early warning system that informs, and improves the efficacy of, crime prevention efforts. To this end, two hybrid spatio-temporal approaches were developed to forecast incidences of criminal damage (CD) in the City of Cardiff, UK. These are the Kernel Density Areas and the Spatial Disagreggation approaches. While both approaches share the same aims they differ in their underlying ways of thinking. The Kernel Density Areas approach uses Kernel Density Estimation to identify geographical areas within which the probability of a CD incident taking place is estimated. Models built independently for the CD time series of each area are then used to obtain the spatio-temporal forecasts. By contrast, the Spatial Disaggregation approach is based on modelling the time series of the entire geographical area and using this model to obtain temporal forecasts. These forecasts are then disaggregated spatially using patterns identified using historic data and exogenous salient inputs such as weekdays and ambient conditions. Forecast accuracy results from both approaches were comparable, with both approaches yielding one step-ahead spatio-temporal forecast Mean Absolute Percentage Error (MAPE) of around 23%. However, the two approaches differ in their usability and the intuitiveness of the models constructed.

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Forecasting World Trade: Direct Versus Bottom-Up Approaches

Stephane Dees, Matthias Burgert
European Central Bank, Germany

Traditionally, trade volumes are forecasted on a country basis by relating them to a domestic demand indicator (domestic demand in the case of imports and foreign demand in the case of exports) and the forecasts for world trade result simply from an aggregation of country-specific forecasts. However, the important changes observed in the last decades in the global economy functionning have to be integrated in any forecasting model of international trade. In fact, with increasing globalisation, it is more likely that global factors have become more predominant to explain international trade activity at the expense of country-specific traditional determinants. These ideas have been applied in this paper, which presents a number of approaches to forecast monthly data for world trade and compares the relative forecasting performance of methods forecasting directly aggregate variables (direct approaches) with methods based on the aggregation of country-specific forecasts (bottom-up approaches).

Overall, the results of this empirical analysis support direct approaches, which perform well in terms of forecast accuracy relative to other benchmarks. Factor models in particular prove rather accurate, where the factors summarise large-scale datasets relevant in the determination of trade flows.

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Combining Forecasting Methods with Characteristic-based Data Analysis and Machine Learning Algorithms

Xiaozhe Wang
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Rob Hyndman, Kate A. Smith-Miles
The Monash University, Australia

This paper introduces a new approach for combining multiple time series models for forecasting. Instead of selecting the 'best' method to forecast a time series data, we combine various methods to obtain better forecasts. We employ data characteristic analysis, clustering and machine learning algorithms.

In previous work, we have proposed a meta-learning approach for characteristic-based forecasting. Time series characteristics are used as meta-features from which selection rules are developed. These rules offer forecasters recommendations in selecting an appropriate forecasting method based on measurable characteristics of a time series. However, model selection is an unstable process because any insignificant changes in data can affect the selection results. Model uncertainty is also a problem which is not usually accounted for in forecasting research.

We use clustering to group datasets based on the identification of global characteristics of time series data. Global characteristics of a time series include classical statistical measures such as trend, seasonality, periodicity, serial correlation, skewness, and kurtosis. We also measure chaos, nonlinearity, and self-similarity. By extracting such characteristic measures, individual time series are categorized according to data features. Hierarchical clustering and self-organizing maps are employed to generate data example groups with similar characteristics.

We then use two machine learning algorithms (neural networks and decision trees) to obtain weights for combining individual forecasting methods.

Our approach is evaluated in an empirical study including four forecasting methods (exponential smoothing, ARIMA, random walk and neural networks) as candidate methods. We measure the forecasting performance improvement of the combination approach compared to the individual methods. An extensive comparative evaluation of our approach in terms of forecasting accuracy is provided.

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Forecasting competition on Transportation data: First results

Michele Hibon
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This new forecasting competition is using a set of 368 time series, including yearly, quarterly, monthly, weekly, daily and hourly series. The data all pertains to the sector of Transportation. We calculate the accuracy of the forecasts given by the competitors, using different accuracy measures. We try to identify the series which were unpredictable by any forecasting methods and intend to explain why.

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H3
Invited Session: Applications in the Health Care Environment

Monday 3:45pm-5:15pm Room: Empire

Chair: Hans Levenbach
Delphus, Inc., USA

Forecasting High-Frequency Time Series With Multiple Seasonal Patterns

Bernard J. Morzuch, Moonyoung Baek, P. Geoffrey Allen
University of Massachusetts, USA

Forecasting high-frequency time series with multiple seasonal patterns has been receiving increasing attention. We consider two issues in estimation: (1) the relation between exponential smoothing methods and univariate models and (2) their comparative forecasting performance.

Existing theoretical and empirical studies have argued that there is an equivalent relationship between the standard Holt-Winters exponential smoothing method and the single source of error (SSOE) state-space model with single seasonality. Such an equivalency has led to a discussion about more reliable prediction intervals based on standard probabilistic approaches. While an additive state-space model with an assumption of SSOE for Taylors additive double seasonal exponential smoothing (DSES) method has been suggested and estimated, that study did not explicitly compare the forecasting performance of the state-space model with either Taylors DSES method or the unobserved components (UC) model approach under the assumption of multiple sources of error (MSOE).

We use high-frequency hospital Emergency Department data and (possibly) electricity load data to examine whether or not an equivalency holds (1) between the DSES method and a UC model with MSOE in state-space form and (2) between the DSES method and a SSOE state-space model that incorporates double seasonality. We compare the forecasting performance of Taylors additive DSES method with a UC model that incorporates double seasonality and is estimated within the context of a state-space approach.

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Forecasting, Competitive Analysis and Environmental Simulation Modeling: New challenges for the HealthCare Industry

Paul Savage
Health Care Intelligence, USA

The scope of problems facing health care executives and operating managers is daunting whether the crisis arises from governance (Boards, Regulators and Physicians), payors, service consumers, or the organizations they manage. The analytical solutions are very complex in balancing the performance of the organization with the disparate needs of many stakeholders.

Most hospital executives and managers have yet to be trained in forecasting and advanced statistical techniques that many other industries have already adopted over the years. This session will focus on the practical application of a dashboard software technology for executives to monitor the competitive environment and the overwhelming problems resulting from the recent NY State Berger Commission Report; that has been recommending hospital closures and realignments.

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A Case Study of a Simulation-Based Decision Support System for Hospital Operating Room Planning

Richard M. Weinberg
Stamford Hospital System, USA

Richard M. Weinberg, MD CPE, is the Chief Quality Officer of the Stamford Health System in southeast CT. He will present the results of a seven-year project collecting data from more than 30 hospitals and health systems. These data were analyzed to compare newer anticoagulant drugs vs. older drugs used in the prevention of deep vein thrombosis (DVT) and pulmonary embolism (PE) reflecting the true costs of each class of drugs and some basic outcomes. He will discuss the strategies the research team used to explain the study methodology and the results to the physicians, quality management personnel and administrators who were the intended audiences for this analysis. Dr. Weinberg will also review how some of the participating organizations used the information to implement successful quality improvement programs.

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NN1
Invited Session: NN3 Competition I

Monday 3:45pm-5:15pm Room: Soho

Chair: Sven Crone
Lancaster University, UK

Benchmark Predictions of Naive Methodologies in modelling Multilayer Perceptrons and Support Vector Regression for the NN3 Neural Network Forecasting Competition

Sven Crone
Lancaster University, UK

Multilayer Perceptron (MLP) Neural Networks and Support Vector Regression are (SVR) are two of the promising contenders in predicting the 111 time series of the NN3 Neural Forecasting Competition. Both offer substantial degrees of freedom in the modeling process: for SVR in selecting the input vector, kernel function and its parameters, cost and epsilon parameters, and for MLP in selecting the architecture through input vector, node architecture, activation functions as well as learning algorithm and parameters. Hence, issues of model parameterization and model selection arise. In lack of an established methodology or comprehensive empirical evidence on modelling MLP and SVR, a number of heuristics and ad-hoc rules have emerged, that result in selecting different models, which show different performance. In order to determine a lower bound for accuracy in the NN3 competition, this paper seeks to compute benchmark results using a naive methodology with a fixed parameter grid-search and exponentially increasing step sizes for the parameters of MLP and SVR for each of the 111 time series. The naive approach attempts to mimic many of the common mistakes in model building, providing errors as a lower bound benchmark to each methods accuracy.

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Time series prediction using Genetic Programming coupled with Hyper-volume Error Separation

Cyril Fillon, Alberto Bartoli
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Time series prediction is a crucial task in many areas but the development of effective modeling and simulation methods to understand or predict the behavior of time dependent phenomena remains particularly difficult. Methods commonly employed for this purpose seek for the optimal or close to optimal values of a predefined set of parameters of a model known beforehand. When the form of this model cannot be found, the problem can be seen from another level where the goal is to find a program or a mathematical representation which can solve the problem. According to this idea the modeling step is performed automatically thanks to a quality criterion which will drive the building process.

We propose to use a Genetic Programming (GP) approach as a robust method for coping with problems in which finding a solution and its representation is difficult but evaluating the performance of a candidate solution is reasonably simple.

A new methodology is applied in synergy with the GP process. The original input space is transformed in a multidimensional input space where a variable is assigned to each distinct time delay. Then, the method deals with scalar functions of N variables and subdivides the input space of N dimensions in two input spaces. This subdivision is realized by a new algorithm called Hyper-volume Error Separation (HES), able to divide the original input space according to the errors made by the best individual found in the early steps of the GP process.

Our results show that coupling HES with GP is an effective approach for this task and could be part of the toolbox of many analysts. Moreover the formulas obtained with the GP process could give better insights on time dependent phenomena.

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Neural Network-Based Time Series Prediction Using Long and Short Term Dependence in the Learning Process

Daniel Patino, B. Kuchen
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J. Pucheta
National University of Crdoba, Argentina

This work presents a solution to the NN3 Forecasting Competition for the Neural Networks & Computational Intelligence, which is organized as special sessions of the International Symposium of Forecasting, ISF'07, International Joint Conference on Neural Networks, IJCNN07, and International Conference on Data Mining, DMIN07. The proposed solution is based on the classical nonlinear autoregression filter (NARF) using time lagged feedforward networks. The learning rule used to adjust the neural net weights is based on the Levenberg-Marquardt method, and we introduce an innovation in the learning process proposing a heuristic law to set up the training stage and to modify the neural net topology. The input patterns for the neural network-based predictor model are the values of the temporal series after applying a time-delay operator. Hence, the neuralnet output will tend to approximate the current value available from the series. The coefficients of the nonlinear filter are adjusted on-line in the learning process, considering in it a criterion that modifies at each time-stage the number of patterns, the number of iterations, and the length of the tapped-delay line, in function of the Hursts value (H) calculated for the time series. According to the stochastic behavior of each series, H can be greater or smaller than 0.5, which means that each series tends to present long or short term dependence, respectively. The algorithm is applied to the 11 temporal series to forecast the next 18 values given in the NN3 Forecasting Competition.

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TS5
Contributed Session: Seasonality I

Monday 3:45pm-5:15pm Room: Duffy

Chair: Brian C. Monsell
U.S. Census Bureau

Parsimonious Seasonal Exponential Smoothing Models

Blyth Archibald
Dalhousie University, Canada

Ralph Snyder
Monash University, Australia

The Holt-Winters' model is the standard exponential smoothing model to use when dealing with seasonal data. It is natural to extend Holts model by the addition of an extra update equation, and the associated smoothing constant to deal with the seasonal factor associated with the data. We examine a number of two parameter models that can be used to deal with the same situation a time series with stochastic level, trend and additive seasonal factors. It is much easier to estimate two than three smoothing constants. Of more importance, when we tested the models on the monthly data from the M1 forecast competition, the proposed models generally provided better forecasts than the three parameter Holt-Winters with additive seasonal factors. The improvement is small, but statistically significant. The model that performed best is the Box-Jenkins (0 1 1) (0 1 1)m ARIMA model. Although usually not considered an exponential smoothing model, we show that the forecasts from the model can be used to determine the associated level, trend and seasonal factors. We use a state space approach to determine the associated update equations.

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Empirical Evidence on Individual, Group and Shrinkage Seasonal Indices

Huijing Chen
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John E. Boylan
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Short-term demand forecasting is a task faced by many organisations and seasonality is a very important component of the forecasts. Seasonal components can be estimated from a stock keeping unit (SKU)s individual history or from a group defined either from a product family or across depot locations. Shrinkage methods have also been proposed to dampen the over-estimation of individual seasonal indices. This paper offers a comparison of empirical results on individual estimation, two group seasonal indices methods, and two shrinkage methods (Miller and Williams, 2003). Further results based on theoretical rules developed by the authors to choose the best method between GSI and ISI show that they are competitive with the rules developed by Miller and Williams (2003).

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The generalised seasonal basic structural time series model and its relation to the frequency specific airline model

Irma Hindrayanto, John Aston, Marius Ooms, Siem Jan Koopman
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John Aston
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The seminal Airline model has been extended recently to improve the properties of model-based seasonal adjustment procedures based on it. By expanding the (seasonal) moving average lag polynomial of the Airline model, implicitly restricted coefficients associated with different seasonal frequencies can be treated as unrestricted coefficients. The canonical decomposition (trend plus seasonal plus irregular) based on this frequency specific Airline model has convenient frequency- and time-domain properties that may lead to more adequate seasonal adjustments. In this paper we explore the generalisation of the basic structural time series model in which the time-varying trigonometric terms associated with different seasonal frequencies have different variances. The extended set of parameters can still be estimated by standard maximum likelihood procedures based on the Kalman Filter. We explore the dynamic properties of the generalised basic structural time series model and relate it to those of the frequency specific Airline model. The relations between model coefficients are highly nonlinear and we rely on numerical techniques to investigate the analogy between the models. However, we do conclude that both generalised models have properties that are very close to each other and lead to very similar decompositions. Apart from the theoretical results, we also show empirically that the approaches lead to similar seasonal adjustments. For this purpose, we consider a US Census Bureau database of seasonal time series that has been analysed previously with the frequency specific Airline models. Standard state space methods are adopted for the analyses. We provide a detailed discussion of our findings and conclude that both generalised basic structural models and frequency specific Airline models can be used in a professional setting.

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Issues in Modeling and Adjusting Calendar Effects in Economic Time Series

Brian C. Monsell
U.S. Census Bureau

This study will examine the effectiveness of some alternate models for estimating working day and moving holiday effects in economic time series. Several alternative approaches to modeling Easter holiday effects will be examined, including a method suggested by the Australian Bureau of Statistics which includes a linear effect.

Also, a more parsimonious technique for modeling stock trading day variation will be examined by using a constrained weekday/weekend trading day contrast regressor and applying it to inventory trading day data.

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TS6
Contributed Session: Time Series II

Monday 3:45pm-5:15pm Room: Olmstead

Chair: Jonathon Stroud
University of Pennsylvania, USA

Time Series Analysis of the Food Stamp Program Caseload

Kenneth Hanson, Charlie Hallahan
U.S. Department of Agriculture

The Food Stamp Program (FSP) caseload, in terms of monthly average number of persons participating in the program, has fluctuated over time following the unemployment rate over the business cycle. From a peak of 28 million persons in March 1994, the FSP caseload fell to 17 million persons in July 2000, only to rise again to 26 million during 2006. This paper applies time series methods to analyze the national monthly FSP caseload over the time period of July 1975 through December 2006. We use the Unobserved Components Model (UCM) in SAS and the structural time series analysis of STAMP. We apply univariate analysis to the FSP caseload. We also access the impact of program policy changes and hurricane relief as interventions and consider treating the unemployment rate as an explanatory variable.

Traditionally, forecasts of the FSP caseload for budgeting purposes rely on the caseloads relationship with the unemployment rate. Forecasting the downturn in the FSP caseload following a turn in the unemployment rate is a challenging task. In addition to addressing the turning point issue, forecasting the FSP caseload should also account for several empirical regularities in the relationship between the FSP caseload and unemployment rate, such as lags and asymmetry. Our time series analysis of the FSP caseload provides an additional tool to help forecast the FSP caseload.

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Algorithmic Approaches to Multiple Time Series Forecasting

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Robert Fildes
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An algorithm is an important element in any problem-solving situation. In econometric methodology, algorithms play an important role in guiding the researcher precisely step by step in model building, model testing, choosing the 'best' model and forecasting using the model chosen. As a result if different researchers used the same algorithm, the same outcome would be obtained. In other words, the algorithm guarantees an explicit way of defining the steps in a particular econometric modelling problem. Many researchers (e.g. Hendry (2003b), Magnus and Morgan (1999), Stigum (2003), Hylleberg (2003)) believe that there is a gap between theoretical and applied econometrics but the algorithm can act as a bridge and lessen the role of tacit knowledge. Hendry and Krolzig (2001) developed the PcGets algorithm, which is an automatic model selection approach for single equation econometric modelling. This selection process involves multiple reduction paths, encompassing, union testing and sub-sample evaluation. An extension of this algorithm for multiple equations using Seemingly Unrelated Regression Equations (SURE) is implemented in this research known as SURE-PcGets. The simulation results show the success of implementing the algorithm in identifying the true model. Comparing with other selection methods based on two error measures, SURE-PcGets was outperformed by a more personalised approach when a problematic data set was used but showed an improvement when using more reliable data. SURE-PcGets also performed well when imposing common structure among equations. Overall, the automatic algorithm was established and it offered a reliable starting point for building SURE models.

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Consistent and positive semi-definite estimator of asymptotic covariance matrix for the time series with irregularly spaced components

Evgeny Panov
Citigroup Global Markets, USA

The paper extends the Newey-West covariance matrix estimator to the case of time series with irregularly spaced components. Similarly to Newey-West estimator, the estimator proposed is consistent and positive semi-definite under the Newey and Wests assumptions modified for the case of irregularly spaced time series. Theorems about properties of estimator are proved and it is shown that estimator proposed is equal to the Newey-West estimator for the synchronously and equally spaced time series. An illustrative example is given for the case of the matrix under estimation allowing a simple alternative analytical representation. Bandwidth parameter selection algorithm proposed by Andrews for quadratic spectral kernel and triangular kernel is modified for the case of time series with irregularly spaced components.

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Optimal Filtering of Jump-Diffusions: Extracting Latent States from Asset Prices

Jonathon Stroud
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Michael Johannes
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Nicholas Polson
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This paper provides a methodology for optimally filtering latent state variables in discretely observed jump-diffusion models. When prices are continuously observed, state variables such as volatility, jump times, and jump sizes are also observed, but with discrete observations these variables are unobserved. We combine discretization schemes with Monte Carlo methods to compute the optimal filtering distribution: the distribution of the latent states conditional on the observed prices. Our approach is very general, applying in models with nonlinear characteristics and even non-analytic observation equations. We use simulations to investigate how sampling frequency affects jump and volatility estimates and then extract information about volatility jointly from equity index options and index returns.

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POS
Poster Session

Monday 5:30pm-6:30pm Room: 7th Floor Prefunction Area

Clustering financial time series with applications to international stock markets

Jorge Caiado
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Nuno Crato
ISEG, Portugal

The volatility pattern often seen in financial time series has increased the interest of researchers in identifying dependences in stock-market indices and returns. Cross-countries stock returns correlation has been extensively studied in the economic and financial literature for portfolio diversification and risk management purposes. Many studies have found small international stock-markets correlations in periods of low volatility (small absolute returns), and much higher correlations in periods of high volatility (large absolute returns). International equity markets comovements have been also widely studied using vector error correction and cointegration approaches, and factor model approaches. However, the identification of similarities or dissimilarities in international stock returns seems not to be enough explored in the empirical financial literature using cluster analysis. The general problem in clustering of financial time series is concerned with the separation of a set of asset return series into groups, or clusters, with the property that series in the same group have similar stochastic dependence structure and series in other groups are quite distinct.

In this paper, we examine the degree of similarity in the major euro and non-euro area stock markets using clustering techniques for financial time series. The clusters of countries are formed by looking to the dendrogram and the principal coordinates associated with the log normalized periodogram ordinates for the returns and squared returns. Our purpose is to investigate whether the structure of stock markets comovements change over time from before to after the introduction of the euro.

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Forecasting inter-occurrence times from covariates under multiplicative censoring. An application to unemployment duration modeling.

Jose A. Cristobal, Pilar Olave, Jose T. Alcala
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We focus on forecasting waiting times between two consecutive events of a stationary renewal process, such as the unemployment times of different individuals in a certain population. We suppose that our data (obtained by cross-sectional sampling) are the backward recurrence times from the occurrence of the last event up to a pre-established time, such as the time between the last unemployment entry and the sampling time (because of our ignorance of the exit of this unemployment period), along with the corresponding values of a certain set of covariates (as, for example, the time spent on employment training courses). We deduce an estimation of the regression function only based on our data, which are obtained through a multiplicative censoring of the unobservable (and biased) durations. We analyze the asymptotic behavior of this estimator, as well as some properties under finite samples.

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Independent Component Analysis for Economic Time Series Forecasting

Ester Gonzalez, Antonio Garcia-Ferrer, Daniel Pena
Universidad Autonoma de Madrid, Spain

In this paper we propose to apply the Independent Component Analysis (ICA) techniques to build the underlying common factors of a multivariate vector of economic time series. In contrast to ordinary ICA, in which the estimation of the independent components is only based on their non-gaussianity, we take into account the time structure of the economic data. Therefore, the problem of linearly decomposing a non-gaussian multivariate time series vector into 'independent' components is addressed. The existing algorithms based on the joint diagonalization of several time delayed covariance matrices do not guarantee independent components if the gaussianity assumption does not hold. In this case higher order information is required. Thus, we propose to combine the time structure of the data with higher order statistics to the extraction of independent components. We use this approach to forecast a vector of economic time series.

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Estimsting Value-at-Risk Using Selection Criteria of the Information Set. An Application to the Spanish Stock Market

Pilar Olave, Manuel Salvador
Universidad de Zaragoza, Spain

In this paper we propose a bayesian procedure to estimate on line the value-at-risk (VaR) of an asset by ARMA-GARCH models. To this aim a semi-automatic selection criterion of the information set of the model base on the posterior predictive distribution is used. The VaR is calculated using Monte Carlo methods. Finally an empirical study on the Spanish Stock Market is carried out.

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K3
Plenary Session

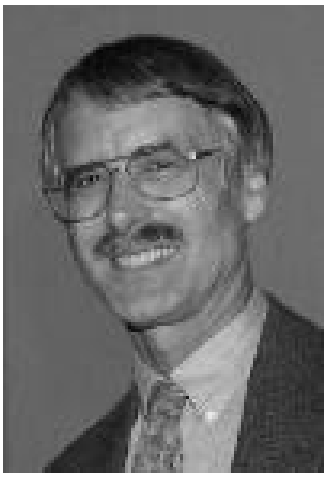
Tuesday 8:00AM--9:00AM Room: Astor Ballroom

Chair: Terrence Kinal
University at Albany - SUNY, USA

Issues and Prospects for Prediction of Climate on Multiple Time Scales

Kevin E. Trenberth
National Center for Atmospheric Research, USA

In contrast to weather, which involves the evolution of the atmosphere, climate involves the entire climate system and its forcings. The climate system includes the atmosphere and oceans as fluid components, and all aspects of the land surface including vegetation and hydrology, and the cryosphere. The forcings include influences external to the climate system, such as the sun or human activities. While prediction of the atmosphere is inherently limited by chaotic developments, its systematic interaction with other components of the climate system and forcings enables patterns or the statistics of atmospheric behavior to have some predictability. On seasonal to interannual time scales the El Ni¿o phenomenon provides the largest source of predictability as large-scale sea surface temperature anomalies alter atmospheric convection and heating and thus large-scale atmospheric waves, known as teleconnections. On decadal time scales the ocean provides the main thermal inertia in the system and should provide some predictability to natural systems. However, human influences on climate are now large enough to enable climate change to be predicted. Past efforts to do this have all been ?boundary value? problems in which no account is taken of the initial state and model runs are differenced to find the change corresponding to a particular emissions scenario (which is a possible ?what-if? future profile of human emissions into the atmosphere based on various assumptions about population, lifestyle, energy intensity, economic well being, etc). The result has been referred to as a projection. In contrast, weather prediction is an initial value problem where all of the skill arises from forecasting the subsequent detailed evolution of the atmospheric dynamics. It is expected, however, that increasingly climate prediction must also become an initial value problem in order to predict the evolution of the ocean, vegetation state, soil moisture, sea ice, etc. in addition to the atmosphere. This will require detailed analyses of the state of these climate components, a whole new information and data processing system, data assimilation, and initialization of these components. Dealing with model biases represents a particular challenge. Ultimately, however, a system will be developed to carry out seamless prediction on multiple time scales, from hours to centuries.



Dr. Kevin E. Trenberth is Head of the Climate Analysis Section at the National Center for Atmospheric Research. From New Zealand, he obtained his Sc.D. in meteorology in 1972 from Massachusetts Institute of Technology. He was a lead author of the 2001 IPCC Scientific Assessment of Climate Change and serves on the Scientific Steering Group for the Climate Variability and Predictability (CLIVAR) program and the Joint Scientific Committee of the World Climate Research Programme. He is a fellow of the American Meteorological Society (AMS) and American Association for Advancement of Science, and an honorary fellow of the Royal Society of New Zealand. In 2000 he received the Jule G. Charney award from the AMS and in 2003 he was given the NCAR Distinguished Achievement Award.

O2
Featured Talk

Tuesday 9:00am-10:00am Room: Olmstead

Chair: Roy Batchelor
City University of London, UK

A Survey of Results from Sports Forecasts

Herman Stekler
The George Washington University, USA

Many studies have analyzed various aspects of sports activities, including the sports betting markets. These markets are similar to financial markets and there have been analyses to determine whether they are efficient. Similarly the forecasting profession can benefit from the findings derived from sports forecasting and apply these results to other specialized fields. This is possible because there are a large number of observations drawn from the real and it is not necessary to rely on laboratory experiments to test hypotheses. The presentation covers findings from horse racing, baseball, football, basketball, etc. The focus will on the characteristics and biases of market forecasts, models that describe the factors determining the outcomes of sporting events, and comparisons of alternative methodologies.

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Comments: Michael McCracken, Federal Reserve Board, USA

Herman O. Stekler is Research Professor of Economics at George Washington University. Previously he had taught at the University of California (Berkeley), the State University of New York (Stony Brook), and the Industrial College of the Armed Forces. He received his Ph.D in economics from the Massachusetts Institute of Technology in 1959. His current research interest is in the area of evaluation of macroeconomic predictions. Dr. Stekler is a Fellow and has been on the Board of Directors of IIF, and is an associate editor of the International Journal of Forecasting.

EN2
Contributed Session: Electricity II

Tuesday 9:00am-10:00am Room: Empire

Chair: Gabriel Pons
Institute of Local Government Studies, DK

Bootstrap procedure for Seasonal Dynamic Factor Analysis with application to electricity market forecasting

Carolina Garcia-Martos, Maria J. Sanchez
Universidad Politcnica de Madrid, Spain

Andres M. Alonso
Universidad Carlos III de Madrid, Spain

Julio Rodrguez
Universidad Autonoma de Madrid, Spain

The aim of this work is forecasting electricity prices with a horizon between six months and one year. Till now, long-term forecasting of electricity prices has been scarcely studied. The vast majority of the methods are related to short-run forecasting. In this work the methodology proposed by Pena and Box (1987), Lee and Carter (1992) and Pena and Poncela (2004, 2006) is applied and extended. Here we present the Seasonal Dynamic Factor Model (SeaDFM), that allows dealing with common factors that follow a VARIMA(p,d,q) (P,D,Q)s and its estimation procedure by means of EM algorithm. Not only the unobserved common factors of the 24 hourly time series are identified and modeled but also the specific ones. The common factors are obtained using the relationships between the 24 hourly time series. The main objective is to obtain not only point forecasts but also an uncertainty measure for them. By means of the bootstrap procedure developed we will also obtain confidence intervals for each element in loading matrix P, studying the long term significance of each of the 24 hourly time series, as well as for the parameters of the VARMA model for the common factors. Bootstrap techniques have a main advantage: they allow taking into account the uncertainty due to parameters estimation, which enhance the coverage of the confidence intervals for the forecasts. The results are promising, with a prediction error around 20% for a horizon between 6 months and one year and can be compared with previous ones: Conejo et. al (2005), Contreras et al. (2003) and Crespo-Cuaresma et al. (2004), obtained prediction errors around 13% for forecasting horizons between 24 and 72 hours.

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Forecasting High-Frequency Electricity Demand with a Diffusion Index Model

Mixing Predictors: Improvement of EDF Electrical Load Forecasting

Yannig Goude, Xavier Brossat
Electricite de France

Electrical load forecasting models used in operation by EDF from many years have generally good performances. If they are robust on the whole they could be improved when the usual form and profile of the load alter over time, due to a change in the consumers behaviour, special days and events, random impacts on consumption, change in weather conditions, etc. From the opening up of electricity market in France, the size of EDF portfolio can vary and the breaks can increase in number and intensity. The signal of consumption will become less and less stationary and EDF must adapt its methods. One solution is naturally to use adaptative parameters. Another approach, presented in this paper, consists in mixing several predictors with time-varying weights. The basic principle is that the mixed predictors quality is almost as good as the one of the best individual predictor on each period. Some theoretical results have been proved recently in this field and mixing algorithms were developed to solve this tracking problem. In this paper, the intrinsic breaks of the load consumption entail changes of the optimal predictor in a pool of experts. The challenge is to track the best expert over time. We introduce a new algorithm adapted to this tracking problem and we test it with real EDF consumption data sets. Every individual predictor is derived from the one used in the operational forecasting process, but set with different parameters, in particular the short-term parameters of the models and the parameters of the temperature/demand relation. We compare, on characteristics periods, this new mixing algorithms predictive performances with the operational forecasts ones. We highlight its capacity to overcome various existing algorithms when breaks occur.

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Gabriel Pons, Philip Hans Franses
Institute of Local Government Studies, DK

We propose a diffusion index model (Stock and Watson, 2002) to forecast electricity demand for one hour to one week ahead. The model is particularly useful as it captures complicated seasonal patterns in the data. The forecast performance of the proposed method is illustrated with a simulated real-time experiment for data from the Pennsylvania-New Jersey-Maryland Interchange.

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BC7
Panel: Economic Outlook for 2007-2008

Tuesday 9:00am-10:00am Room: Duffy

Panel Discussion: Economic Outlook for 2007-2008

Chair: Gad Levanon
The Conference Board, USA

In recent quarters the U.S. has been experiencing slower economic growth in the U.S. which comes as a result of a correction in the housing sector and weaker manufacturing growth. Where are we headed from here? Did the U.S. housing sector hit rock bottom? What is the impact on the rest of the economy?

Strengthening economic performance and strong growth prospects in Europe and Asia as well as increasing global trade may help offset these economic dynamics in the U.S. as well as the resilience of the U.S. consumer sector and positive developments in the U.S. corporate profits. These developments are taking place in the context of the emergence of China in the last two decades and more recently of India on the global market place.

What are the risks to the U.S. economy in this environment, and what are the risks to the global economy? How sustainable is the growth potential of global economies in the near term? What are the strengths in these economies going forward? What forces will shape the global economic landscape in the next one to two years?

Panelists: Gail Fosler, The Conference Board, USA
Jason Benderly, Benderly Economics Inc., USA
Chris Varvares, Macroeconomic Advisers, LLC, USA

F5
Invited Session: Efficient Trading

Tuesday 9:00am-10:00am Room: Gotham

Chair: Jose Mario Quintana
BEST, LLC, USA

A Systematic Directional Trading System

Amitava Agarwala
SSG Advisors, USA

In the development of trading systems, good price forecasts are difficult to attain. Distributions that are stable like the normal distribution do not exist in the financial markets. Systems that rely on normal distribution fail due to the presence of fat tails. To get around the problem, traders have built systems using non-normal systems as well as more esoteric concepts like fuzzy logic, artificial intelligence etc. In my systematic trading system, I get around this problem by forecasting a price series that is normally distributed. This series is derived from the financial price data using OLS regression. Subsequently, the output is moderated using a momentum and stochastic factor. The result is an approximately normal distribution. I call the value thus arrived Equilibrium price. Not surprisingly, the model does not work well when the actual price is close to the Equilibrium price but when the correlation between them varies around 0.97 to 0.98. Mathematically, it is not a rigorous solution but it is not expected to be. The trading system exploits the difference between approximately normal distribution and market non-normal price distribution.

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Risk Forecasting in Financial Markets

Damian Handzy
Investor Analytics LLC, USA

Hedge Funds routinely invest in a variety of securities and funds specifically designed to avoid significant pitfalls. Measures like Value-at-Risk, Expected Shortfall, and a variety of volatility metrics are commonplace, but only some Hedge Funds actively use tools to simulate how their portfolio might behave in periods of market stresses. The most sophisticated fund managers do not rely on risk measures for an absolute measure of their risk, but extract information from changes in the risk over time. Analyzing Hedge Fund performance and extracting driving factors of return and risk has gained both popularity and credibility.

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The Bayesian Nature of the Financial Markets' Prices

Jose Mario Quintana
BEST, LLC, USA

Liquid free financial markets, according to most watchers, behave as efficient information processing devices that are difficult to beat. It can be argued that even if market participants were not acting formally as Bayesians; a Bayesian behavior, for the markets as a whole, would inevitably emerge. Only basic fear and greedy attitudes, related to coherence and consistency, need to be assumed for the participants. Furthermore, a natural evolutionary process applied to the participants would positively affect the quality of the markets' Bayesian behavior. Yet, although Financial Markets might be formidable opponents they are not invulnerable.

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FM7
Contributed Session: Perspectives on Forecasting I

Tuesday 9:00am-10:00am Room: Soho

Chair: Stein Grimstad
Simula Research Laboratory, Norway

Worst Practices in Business Forecasting

Michael Gilliland
SAS Institute, USA

Worst practices can plague any forecasting process, leading to unnecessary investment, wasted resources, demoralized staff, inferior forecasting results, and poor financial performance. Examples of worst practices include having unrealistic accuracy expectations, setting inappropriate performance targets, and investing in elaborate systems and processes without validating their impact. Others involve over-fitting statistical models to historical data, assuming the ''best fit'' model will generate the best forecasts, failing to utilize a naive forecast as a reference for comparison, excessive tampering with statistical forecasts, and blaming the forecast for all business woes. This presentation will expose several easily identifiable ''worst practices'' and describe their unsavory consequences. Attendees will about simple methods such as Forecastability Analysis and Forecast Value Added Analysis that allow worst practices to be identified and eliminated. By simply avoiding the biggest mistakes, organizations can get better forecasting results with less effort and no additional investment.

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Against your better judgment? Do organizations follow the forecasting principles when applying management judgment to their forecasts?

Paul Goodwin
University of Bath, UK

Robert Fildes
Lancaster University, UK

Accurate forecasts are crucial to successful planning in many organizations and in 2001 forty international experts published a set of principles to guide best practice in forecasting. Some of the principles relate to the use management judgment. Almost all organisations use judgment at some stage in their forecasting process, but do they do so effectively? While judgment can lead to significant improvements in forecasting accuracy, it can also suffer from biases and inconsistency. The principles therefore indicate how forecasters should use judgment and how they should assess its effectiveness. The question we examine is whether judgment is used according to these established principles. We conducted a survey of over 120 forecasters to investigate whether their forecasting procedures were consistent with the principles. In addition, we conducted four in-depth case studies. We found examples of good practice. However, many organizations could improve forecast accuracy if they followed basic principles like limiting judgmental adjustments of quantitative forecasts, asking managers to justify their adjustments in writing and assessing the track record of judgmental interventions. While almost all the respondents believed that forecasting accuracy was important all too few were taking the basic steps needed to achieve that goal.

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The impact of irrelevant information on inconsistency in expert judgment-based estimates of software development work

Stein Grimstad
Simula Research Laboratory, Norway

Effort estimation is an important activity in software development and provides essential input to pricing, planning and budgeting processes. Unfortunately, many software effort estimates are inaccurate. The consequences of inaccurate estimates can be severe, e.g., budget-overruns, delayed time-to-market, and poor quality software. Most software effort estimation work is at least party based on expert judgment, i.e. non-mechanical and unconscious processes. Therefore, a certain degree of intra-person inconsistency is expected, i.e., the same information presented to the same individual at different occasions sometimes lead to different effort estimates. We have conducted an experiment where seven experienced software professionals estimated the same sixty software development tasks over a period of three months. Six tasks were estimated twice. We found a surprisingly high degree of inconsistency in the software professionals effort estimates. The mean difference of the effort estimates of the same task by the same estimator was as much 71%. The correlation between the corresponding estimates was 0,7. Highly inconsistent effort estimates will, on average, be inaccurate and difficult to learn from. It is consequently important to focus estimation process improvement on consistency issues. Evidence from other forecasting fields recommends that to reduce inconsistency, only the most important estimation information is used as input to the estimation work. We have empirically examined this advices applicability to software effort estimation by analysing inter-estimator agreement in six software effort estimation experiments that report on the impact of including information of low or no relevance in the input to estimation work. The main findings are that inconsistency can increase when information of low or no relevance is present, and that this happens in spite of the software professionals knowing and accepting the lack of relevance.

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TS7
Contributed Session: Mixed Frequency

Tuesday 9:00am-10:00am Room: Hudson

Chair: Ana Beatriz Galvao
University of London, UK

Forecasting with Mixed-Frequency Time Series Models: A Simulation Study

Klaus Wohlrabe
IFO Institute for Economic Research, Germany

This paper compares in a simulation study the forecast performance of two current approaches to handle mixed-frequency time series in one time series model. We review the mixed-frequency VARMA model by Zadrozny (2007) and the MIxed DAta Sampling (MIDAS) approach by Ghysels et al. (2006). The state-space VARMA approach assumes that the model operates at the highest frequency. All variables are assumed to be generated, but not necessarily observed, at this highest frequency, and thus produces forecasts of any variable at this frequency. The MIDAS approach specify conditional expectations as a distributed lag of regressors at some higher sampling frequencies. In its practical specifications the lowest frequency is regressed on the higher frequency. We simulate a large number of bivariate data sets (1000)assuming that the higher frequency time series has some leading properties for the lower frequency time series. We generate missing values due to typical frequency faced in empirical macroeconomics, e.g. monthly and quarterly or monthly and weekly. In order to see if the forecast performance depends on the sample size we generate models from 60 to 500 observations for the lower frequency. As benchmark models we estimate an AR and VAR process. As a general result we find that mixed-frequency time series models do outperform standard single-frequency approaches. For all models, time series lengths and forecasting horizons the MIDAS model delivers on average better forecasts than the benchmark models. For small mixtures and short forecasting horizons the VARMA model is better than MIDAS and vice versa. For large mixtures the number estimated parameters in the VARMA models increases dramatically as it assumes that the model operates at the highest frequency. This leads to overfitting, transmission of noise from the higher to the lower frequency and deteriorates the forecast performance. The general results holds for small samples, too.

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Modeling the non-linear relationships between Daily Open Value and Intra-day Volatility in Global Indices using an enhanced Polynomial Neural Network

Saurabh Sureka, Sanjeev Malalur, Michael Manry
University of Texas at Arlington, USA

Polynomial Neural Networks like the Functional Link Network (FLN), Group Method of Data Handling (GMDH) and Pi-Sigma Network model non-parametric systems in form of the Kolmogorov-Gabor / Ivakhnenko polynomial. Computational and performance advantages of these networks compared to Multi Layer Perceptrons and Genetic Algorithms are well established. We apply a Recursive Gram-Schmidt Orthonormalization procedure to a FLN to generate and sort higher order polynomial basis functions in order of their contribution to reduce the Mean Square Error (MSE). The resultant network is called the Ordered Functional Link Network (OFLN) and it reduces possibility of combinatorial explosion. Results for certain learning problems show better approximation and network sizing capabilities over most other networks. Daily Open Value and intra-day volatility data for leading American, European and Asian market indices are analyzed for relationships. Mean Absolute Percentage Error (MAPE), MSE, and cumulative distribution of MAPE for training and validation datasets are compared for OFLN, FLN, GMDH and MLP (using Levenberg Marquardt algorithm).

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Changes in Predictive Ability with Mixed Frequency Data

Ana Beatriz Galvao
University College of London, UK

This paper proposes a new regression model--a smooth transition mixed data sampling (STMIDAS) approach--that captures recurrent changes in the ability of a high frequency variable in predicting a low frequency variable. The STMIDAS regression is employed for testing changes in the ability of financial variables sampled weekly in forecasting US output growth sampled quarterly. The estimation of the optimal weights for aggregating weekly data inside the quarter improves the measurement of the predictive ability of the yield curve slope for output growth. Allowing for changes in the impact of the short-rate and the stock returns in future growth is decisive for finding in-sample and out-of-sample evidence of their predictive ability at horizons longer than one year.

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O3
Contributed Session: Presidential Election II

Tuesday 9:00am-10:00am Room: Herald

Chair: Forrest Nelson
University of Iowa, USA

Forecasting the 2008 US Presidential Election: A State-By-State Pooled Time Series Model

Bruno Jerome, Veronique Jerome-Speziari
University of Metz - IRGEI and University of Paris II Pantheon Assas, France

In this paper we are looking for explanatory factors in the US presidential election, building a forecasting model in accordance with the logical framework of politico-economic models, we have already used for past French elections. The appreciation of the evolution of the political context and the economic situation by the voters constitute reference points which express themselves in reward/punishment vote for the incumbent held responsible for the political and economic situation. While most of the models in this area are working on the basis of aggregated data, we are using local explanatory factors to take into account the specific political and economical local context, as well as some national factors like the presidential approval. We have identified over the period 1980-2004 (N= 364) five explanatory factors of the vote : (1) the economy via the change in the unemployment rate (by state) during the presidential mandate, (2) an indicator of policy measuring the tendency posted since 1952 within each state, (3) the credibility of the executive given by Gallup job approval rates (and the electoral cost of a candidature of the Vice President), (4) the role of the electoral system (influence of Super Tuesday, divided governments, influences of Primary elections, nuisance power of the third party), (5) and finally, the weight of the democratic and republican areas of strength.

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The Keys to the White House: Forecast for 2008

Allan Lichtman
American University, USA

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 every presidential election from 1984 to 2004. 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 2008, 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.

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Prediction Market Accuracy in the Long Run: a comparison with opinion polls over six U.S. presidential elections

Forrest Nelson, Joyce Berg, Thomas Rietz
University of Iowa, USA

''Prediction markets'' are specialized financial markets designed specifically to forecast outcomes of uncertain events such as elections. Though prediction markets have been conducted on the Iowa Electronic Market for each of the last six U.S. Presidential elections in the U.S., to date nearly all evidence on the accuracy of predictions arising from them have involved the comparison of election eve forecasts to the final pre-election polls. Here, we do two things. The first is to present in one place a full compilation of the evidence from those six elections, with comparisons of the prediction market forecasts to the election outcomes and to the election eve polls. Results of that comparison show prediction markets prices are on average nearly one percent closer to the election vote-share outcome than are election eve polls. The second contribution is to add a comparison of polls with the market forecasts over the entire course of each of the six campaigns in order to assess the longer-run accuracy of the two indicators of the likely election outcomes. Results there show prediction market prices are closer to the election outcome than polls over 70 percent of the time.

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FM8
Featured Talk

Tuesday 10:15am-11:15am Room: Olmstead

Chair: Kajal Lahiri
University at Albany - SUNY, USA

What indicators are and what do they forecast, how and how well? A global and historical perspective (from NBER to TCB)

Victor Zarnowitz
The Conference Board, USA

This paper attempts to present in succinct yet reasonably complete form both the methodology (section 1) and main results (sections 2 and 3) of the recent work on business cycles of The Conference Board. It first introduces the concepts and measures of time-series decomposition and the distinction between, and the roles of, the leading, coincident, and lagging indicators. It proceeds to discuss how TCB identified and dated business cycles in nine countries during the past half-century, and with what results. Next it shows the coincident and leading composite indexes for four of these countries (United States, Australia, Japan, and South Korea; omitted are Mexico, United Kingdom, France, Germany, and Spain that will be discussed in a separate paper, along with the European Union, work on which continues). Here the focus is on how well the coinciders represent, and how well the leaders anticipate, growth and fluctuations in each of these countries. The paper concludes with a brief summary on ''Some Inferences and a Look Ahead.''

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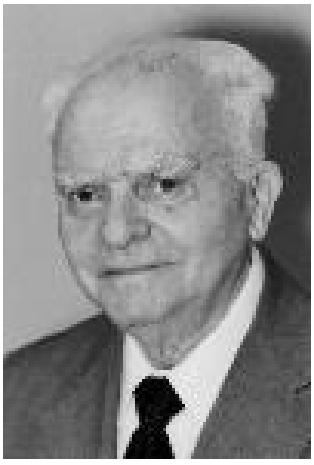
Comments: Arnold Zellner, University of Chicago, UC Berkeley, USA



Victor Zarnowitz, one of the worlds leading scholars on business cycles, indicators and forecast evaluation, is Senior Fellow and Economic Counselor to The Conference Board. He is Professor Emeritus of Economics and Finance, Graduate School of Business, The University of Chicago, and Research Associate, National Bureau of Economic Research (NBER). He is one of six noted economists who officially decide whether the U.S. economy is in recession or recovery.

He has been with NBER since 1952, and with several other government agencies. He has lectured at major universities, including the universities of Munich, Zurich, Columbia, Stanford and others. He was co-editor of the *Journal of Business*, *Economic Forecasts*, and the *ASA-NBER Quarterly Survey of Economic Outlook*.

Dr. Zarnowitz earned his Ph.D. in economics at the University of Heidelberg (Germany). He is Fellow of the National Association of Business Economists, Fellow of the American Statistical Association, Honorary Fellow of the International Institute of Forecasters, and Honorary Member of the Center for International Research on Economic Tendency Surveys (CIRET). In 2001, he received the William F. Butler Memorial Award from the New York Association for Business Economics. He has published numerous papers and books.

FM9
Contributed Session: Combining Forecasts

Tuesday 10:15am-11:15am Room: Duffy

Chair: Albert Caspers
Bundesministerum fur Wirtschaft und Technologie, Germany

Prediction using different estimators in time series regression models

Yue Fang
University of Oregon, USA

We quantify the effects of estimation on prediction generated from time series regression models. The estimators considered are unconditional least squares, maximum likelihood and conditional least squares. The results suggest that although these estimators are asymptotically equivalent, the finite sampling properties of predictors based on those estimators can differ substantially, because of differences in finite-sample estimation efficiencies and residual regeneration methods.

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Adaptive Combination of Forecasts for Wind Power Prediction

Ismael Sanchez
Universidad Carlos III de Madrid, Spain

Obtaining efficient wind energy prediction is a difficult task. Poor predictions can generate looses both to the utilities and to the System Operator. For that reason, many utilities use alternative wind energy predictions instead of relying into a single one. It can happen that some predictions can be more efficient in some moments or some sites, and then have lower competitive performance in some other circumstances. Forecast combination is then a very convenient tool to produce an efficient final prediction. This work describes an adaptive forecast combination system for wind energy prediction. The main feature of the proposed combination system is its adaptability to the relative performance of the predictors. Classical combination schemes tend to assign a fixed weight to each alternative predictor. Then if a predictor looses efficiency, the final prediction deteriorates its performance. Conversely, the proposed adaptive combination method uses time varying weights for each alternative predictor. The proposed methodology can be seen as a mixed selection-combination method. When the combination of the predictors can lead to an improved prediction, the proposed method tries to find such combination. However, when there is a single predictor that can not be surpassed, the proposed method tends to select it as a final predictor.

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Applied Forecasting: The Practitioners Experience

Albert Caspers
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The paper describes the iterative analytical approach applied for short-term macroeconomic forecasting in the German government. This approach is a recursive step by step procedure. The principles of proceedings are presented and explained. The application of the analytical and econometrical methods is demonstrated. The characteristics of this approach is to use as many information as possible together with a variety of econometric methods. The use of the methods and models depends upon the data situation and the needs of the final forecast procedure. Not only a single model but different analytical tools are applied e.g. correlation / regression analysis, time series analysis etc.. ''Crucial variables'' according to the structure of the economy have to be identified. Economic indicators especially for the crucial variables are selected for the description and the analysis for the current situation. They are also used to judge upon the status of the business cycle and to identify short term economic perspectives. Time series of relevant indicators are combined with national account data. For the estimation of national account variables several econometric methods are applied. Judgement about the most likely of the different results is necessary taking comparable situations of the past into account. Cross checks in the framework of national accounts are performed. The role of econometric models, calibration, and judgemental approaches are discussed. All steps of the recursive forecasting procedure are presented. Partial models are used for the forecast of important economic variables (foreign trade, investments, consumption, public sector, labour market). The results are given into a core model, reflecting the national account framework.

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EN3
Contributed Session: Electricity III

Tuesday 10:15am-11:15am Room: Empire

Chair: Antonio Munoz San Roque
Universidad Pontificia Comillas, Spain

Forecasting the Electricity Market of Spain with BoxOX-Jenkins and Neural Networks

Jose Parreno, Raul Pino, David De La Fuente, Isabel Fernandez
Edificio Energia - Campus de Viesques, Spain

In this paper, Box-Jenkins and Artificial Neural Nets methodologies are used to calculate forecasts for several time series belonging to the Spanish Electricity Production Market. This market has been working for more than seven years in Spain, so that variables are composed of thousands of observations. These variables include Energy Hourly Price, Energy Maximum and Minimum Daily Price and Load Hourly Demand. We split each time series into a training set to fit the model, and a test set to evaluate model forecasts. Then, we use the Mean Percentage Error (MAPE) to compare both forecasting methodologies accuracy. First of all, univariate models for each series are obtained and then forecasts calculated. In second place, transfer function models to forecast Energy Hourly Price, in which Load Hourly Demand is included as an input variable, are constructed. Results show that for all univariate and transfer function models, both methodologies provide very accurate forecasts, Neural Nets performing better than Box-Jenkins. For both methodologies, better forecasts are calculated when using the transfer function models.

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Forecasting electricity futures volatility through hedging methodologies

Giovanna Zanotti, Giampaolo Gabbi, Manuela Geranio
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The purpose of this study is to analyse the efficacy of futures contracts on hedging electricity prices. This is reached testing the following methodologies: the zero base hedging, the Exponential Smoothing Correlation Model, and its generalised solution, the Quasi Maximum Likelihood Estimation Method, the Conditional Correlation Models and the GARCH-BEKK model proposed by Engle and Kroner (1995). Three are the electricity markets we compared: EEX (Germany), PowerNext (France) e NordPool (Scandinavia). In all cases, we measured how volatility can be reduced. All these solutions have been tested in a forecasting-oriented process, with in-sample outcomes compared to the out-of-sample ones. Our conclusions appear to be robust, since all the three futures markets, in time series from 432 to 1476 daily data, show that the Constant Conditional Correlation Model is the method able to minimize the volatility of an electricity energy position. In this case covariance is time varying thanks to the dynamics of volatility. He benefit in term of volatility hedging is maximum in the German market (-16,72%) and minimum in the French one (-0,007%). The hedging quality of the Conditional Correlation Models is confirmed by the hedging performance. Moreover, our results confirm Bystrom (2003) conclusion obtained only in the NordPool market - that static hedging strategy can compete with dynamic methodologies.

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Advances in forecasting interval-valued time series with Multilayer Perceptrons. Application to eletricity price intervals in energy markets

Antonio Munoz San Roque, Carlos Mate, Angel Sarabia
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An interval-valued time series (ITS) may be defined as a sequence of observed intervals taken sequentially in time. These time series are usually obtained by spatial or temporal aggregation of univariate time series, as it is the case of daily electricity prices ranges where the observed intervals are delimited by the minimum and maximum hourly prices of each day.

Forecasting interval-valued time series is a very promising research area where several results have been reported in the last two years. It may be performed in two ways: two separate time series (corresponding to interval centres and radii for example) can be forecasted with standard methods, or interval arithmetic can be applied in order to operate directly on intervals.

In this paper the second approach is addressed and an Interval Neural Network that will be called interval Multi-Layer Perceptron (iMLP) is proposed for dealing with interval-valued inputs and outputs. The proposed neural network has single-valued weights and biases, but its transfer function and learning rule is adapted to operate on intervals.

The iMLP is applied to the forecasting of ancillary services price intervals in the Spanish electricity market and its performance is compared to other methods. The purpose of ancillary services and deviation management is to ensure that energy is supplied under established conditions of quality, reliability and security and that production and demand are balanced at all times. As a non mandatory ancillary service, energy producers have the opportunity to participate in the secondary reserve market in order to ensure the secondary regulation requirements published by the System Operator for the next day. The forecasting of the resulting clearing prices is a valuable tool for energy traders in order to optimize their joint participation in energy and ancillary services markets.

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F6
Contributed Session: Financial Risk

Tuesday 10:15am-11:15am Room: Gotham

Chair: Jonathan Reeves
The University of New South Wales, Australia

Refunding Market Indexes using VaR

Jordi Andreu Corbaton
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Salvador Torra Porras
Universidad de Barcelona, Spain

Is it possible to create new Market Indices that are less risky than current ones? We propose a methodological approach to deal with this question using Value-at-Risk Minimization on the parametric VaR method. With this approach we can obtain the optimal weights each share must have in the Index to minimize Risk measured by VaR. We apply our method to three different stock markets and estimate Covariance matrices by different length moving averages. We would like to point out two innovations in our paper. First, an error dimension has been included in the backtesting and, second, the Sharpe Ratio has been used to select the 'best' model from all models presented. Although the estimation methods used are very simple, our results seem very interesting. All our indices are less risky than the Spanish IBEX 35 and the Argentinian Merval (current Market Index) and, surprisingly, more profitable; this does not happen in the American DowJones.This highlights two points. First, our indices could manage market risk without the problems of current risk measures [Basak and Shapiro (2001)]. Second, similar investment strategies could beat the market in some cases, thus questioning the Efficient Market Hypothesis, especially in emerging markets. The possible applications of our Minimum Risk Indices are clear: they could reduce the risk assumed by institutional and mutual funds that nowadays follow Market Indices (these institutions could follow indices such as ours if it is confirmed that they are more profitable and less risky than some market indices). They could also be used as a benchmark for risky assets or as a basis for developing derivatives.

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Forecasting the Time-Varying Beta of UK Companies

Hao Wu, Taufiq Choudhry
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This paper investigates the forecasting ability of four different GARCH models and the Kalman filter method. The four GARCH models applied are the bivariate GARCH, BEKK GARCH, GARCH-GJR and the GARCH-X model. The paper also compares the forecasting ability of the GARCH models and the Kalman method. Forecast errors based on 20 UK company weekly stock return (based on time-vary beta) forecasts are employed to evaluate out-of-sample forecasting ability of both GARCH models and Kalman method. Measures of forecast errors overwhelmingly support the Kalman filter approach. Among the GARCH models both GJR and GARCH-X models appear to provide a bit more accurate forecasts than the bivariate GARCH model.

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Monthly Forecasts of Systematic Risk: An Evaluation

Jonathan Reeves, Vince Hooper, Kevin Ng
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Recent advances in covariance and variance estimators coupled with improvements in the quality of intra-day data have made possible more precise measurement of beta (systematic risk). In this paper we examine the forecastability of beta for Dow Jones stocks. The out-of-sample forecasting exercise conducted in our study results in a dramatic reduction of forecast error of beta on average by over 80%, relative to the industry standard of the constant model. This finding has vast implications for all aspects of finance as precise forecasting of the beta parameter is of crucial importance.

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EC4
Contributed Session: GARCH Models

Tuesday 10:15am-11:15am Room: Soho

Chair: Brent Hudson
Corporate Finance and Credit Control - Country Energy, Australia

Non-negativity conditions for the Hyperbolic GARCH Model

Christian Conrad
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Long-range dependence in the absolute or squared observations of many macro and financial time series has become a widely documented stylized fact. A specification which allows for a hyperbolic decay of shocks to the conditional variance, and so explicitly captures the empirical observation is the Hyperbolic GARCH(p,d,q) model of Davidson (2004). The model is becoming increasingly popular among practitioners and heavily applied in risk and portfolio management. In this article we derive conditions which ensure the non-negativity of the conditional variance in the Hyperbolic GARCH(p,d,q) model. Non-negativity conditions for the HYGARCH process are important since their validity is a necessary condition for the parameters of a particular HYGARCH model to represent a well defined non-negative conditional variance process. Similar as in the FIGARCH case one can not deduce the non-negativity of the conditional variance from the sign of the estimated parameters which means that non-negativity conditions should always by checked. The conditions are necessary and sufficient for p<=2 and sufficient for p>2 and emerge as natural extensions of the inequality constraints derived in Nelson and Cao (1992) for the GARCH model and in Conrad and Haag (2006) for the FIGARCH model. Moreover, we obtain a representation of the ARCH infinity coefficients which allows computationally efficient multi-step-ahead forecasting of the conditional variance. The availability of the forecasting algorithm is of great importance for any researcher employing the HYGARCH model e.g. for Value-at-Risk computations or option pricing. First, our recursive representation provides an efficient way of calculating multi-step-ahead volatility forecasts, and second the inequality constraints guarantee the non-negativity of the forecasted conditional variances. An empirical application of the HYGARCH(1,d,1) model to daily NYSE data illustrates the importance of the result.

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Multivariate GARCH Models with Correlation Clustering

Iris Han Yip Wing, Mike K.P. So
The Hong Kong University of Science and Technology

This paper proposes a clustered correlation multivariate GARCH model (CC-MGARCH) which allows the conditional correlations to form clusters where each cluster follows the same dynamic structure. One main feature of our model is to form a natural grouping of the correlations among the series while generalizing the time-varying correlation structure proposed by Tse and Tsui (2002). To estimate our proposed model, we adopt Markov Chain Monte Carlo methods. Forecasts of volatility and value at risk can be generated from the predictive distributions. The proposed methodology is illustrated using simulated and financial markets data.

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A Bayesian Approach to Relaxing Parameter Restrictions in Multivariate GARCH Models

Brent Hudson
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Richard Gerlach
University of Sydney, Australia

The major goal of this paper is to propose a Bayesian prior formulation for a multivariate GARCH model that will expand the parameter space usually explored for such models, directly enforcing both the necessary and sufficient conditions for positive definiteness and covariance stationarity via their definitions. Therefore we relax the restrictions of standard approaches, where only sufficient conditions are enforced via unnecessary parameter restrictions. A secondary goal is to propose a VECH model specification that allows both parsimony and parameter interpretability, as opposed to existing popular specifications that achieve only one of these. We consider a Bayesian approach, designing a Markov chain Monte Carlo scheme that employs the Metropolis-Hastings and delayed rejection algorithms, to estimate the parameters of the model. We illustrate our methods with a simulation study showing favourable estimation and improved coverage performance of confidence intervals, compared with standard large sample methods, for a bivariate model. Finally, we analyse some real financial stock returns, the results of which are compared with large sample maximum likelihood theory.

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BC8
Contributed Session: Inventory Forecasting

Tuesday 10:15am-11:15am Room: Hudson

Chair: Thomas R. Willemain
RPI and Smart Software, Inc., USA

Forecasting and Periodic Inventory Control for Slow Intermittent Demand Items

M. Zied Babai, Aris A. Syntetos
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Intermittent demand is characterized by occasional demand arrivals interspersed by time intervals in which no demand occurs. The compound nature (i.e. demand arrivals and demand sizes) of these patterns poses considerable difficulties as far as forecasting and stock control are concerned. Such demands may often be very sporadic (slow intermittence) resulting in very lengthy average inter-demand intervals. Moreover, recent developments in Logistics and Transportation have resulted in considerable decreases in lead times. In that respect, we have very often come across cases where the lead-time length is (considerably) shorter than the average inter-demand interval necessitating a departure from the traditional approaches to forecasting and inventory control for the relevant Stock Keeping Units (SKUs). This issue constitutes the focus of our research. Some modifications are proposed to the standard forecasting, order-up-to-level inventory control approach to dealing with intermittent demand items. In particular, we develop an approach that relies upon the employment of two separate estimates of the constituent elements (intervals and sizes) directly for stock control purposes rather than first estimating mean demand (per unit time period) and then feeding the results in the stock control procedure. The empirical validity of our approach is assessed by means of experimentation on a large demand data set from the Royal Air Force (RAF, UK). The benchmark approach comprises a Croston-based methodology for estimating mean demand in conjunction with the standard periodic order-up-to-level policy. The results indicate the scope for improving real world inventory management systems when lead times are shorter than inter-demand intervals.

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Describing Demand Uncertainty in an FSS

Hans Levenbach
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Most Forecast Support Systems (FSS) inadequately identify and describe demand uncertainty for practical uses. For instance, invalid theoretical assumptions are frequently used in inventory forecasting systems when determining safety stock. Other examples can be found in creating forecast scenarios for brand revenues for use in marketing and forecast ranges for disaggregated stock keeping units for use in production. In all these practical situations, the FSS has to provide reasonable numbers based on defensible approaches. How can we effectively deal these issues in practice? In this talk we describe a three-pronged approach that has shown some promise in a commercial FSS.

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Assessing the Accuracy of Forecasts of Distributions

Thomas R. Willemain
RPI and Smart Software, Inc., USA

Charles N. Smart
Smart Software, Inc., USA

Conventional measures of forecast accuracy focus on the error in point forecasts and are not suited to assessing error when an entire distribution is being forecasted. This problem arises in inventory control settings, where the presence of many zero demand values often arises and creates further complications. We discuss methods for assessing error in forecasts of distributions, with special attention given to intermittent demand for service parts.

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O4
Invited Session: Presidential Election III

Tuesday 10:15am-11:15am Room: Herald

Chair: Mark Pickup
University of Oxford, UK

Presidential Election Forecasting: The State of the Art

Randall J. Jones, Jr.
University of Central Oklahoma, USA

This paper assesses the current state of U. S. presidential election forecasting, emphasizing methods and predictions for the most recent election, 2004. Forecasting methods then in use are identified, and an assessment is made of their accuracy for alternative pre-election forecast horizons. A brief description of past applications of the respective methods also is provided. The progressive development of the field is traced, as existing methods have been refined and new methods have been applied to the forecasting task. The election forecasting methods reviewed include public opinion polls, regression models, prediction markets, threshold or cutpoint indicators, indexes, Delphi expert surveys, and bellwether states. Also noted is the technique of combining forecasts produced by one or several methods, a practice new to this field, which usually has increased forecast accuracy.

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Forecasting the Presidential Primary Vote in Open Presidential Nominations

Wayne Steger
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This paper builds on previous forecasts of the aggregate presidential primary vote (Mayer 1996, 2002; Adkins and Dowdle 2000, 2004; Steger 2000; Steger, Adkins and Dowdle 2004). Forecasting the aggregate presidential primary vote represents a unique forecasting challenge since there are multiple candidates competing in a sequence of primaries. Despite these obstacles, reasonably accurate forecasts can be made using information from the pre-primary campaign. The models employ pooled time series from the 1976 to 2004 presidential nominations. The forecasting models improve on prior research by incorporating elite party endorsements and estimates of candidate electability, in addition to the traditional campaign finance, media coverage and public opinion poll data. The estimates indicate that elite endorsements are significant predictors of both parties' primary vote, but cash reserves are significant only for Democrats while pre-primary national Gallup poll results are significant only for Republican nominations. In addition, the paper presents the basic forecast models updated by the results of the New Hampshire Primary vote to predict candidates shares of the subsequent primary vote. These models indicate that the primary affects both parties remaining primary vote, but more so for Democrats. Republican nominations are largely predictable and determined mainly by effects occurring prior to the primaries, while Democratic nominations are relatively unpredictable before the primaries and are largely a function of momentum during the primaries. The paper will also discuss some of the challenges in forecasting the aggregate presidential primary vote as a unique forecasting challenge. The forecasting challenge differs from presidential elections since the primary vote is distributed among multiple candidates, some of whom are winnowed in the sequence of primaries; and since the primary vote is not a direct referendum on the incumbent administration.

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Campaign Trial Heats as Election Forecasts: Measurement Error and House Bias in 2004 Presidential Campaign Polls

Mark Pickup
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Richard Johnston
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This paper attempts to assess the accuracy of trial heat polls as election forecasts and considers two alternative methods for extracting house bias and sampling error from estimates of voter preference. These two methods are emerging as the front runners in the field. One method is sequential: house bias is extracted by a straightforward regression technique (Erikson and Wlezien, 1999) and the resulting house-adjusted series is filtered via a Kalman filter. The other method uses a Bayesian state-space model to extract house and sampling effects simultaneously (Jackman, 2005). The latter technique also allows assessment, relative to the actual outcome, of the industry as a whole. To test these methods we draw upon polls reported during the 2004 US Presidential election. We find that house bias is made to seem stronger when estimation is sequential, and we explore the reasons for this. The burden of evidence suggests that the bias in specific firms and polls is not a very serious problem. There might, however, be reason to worry about the industry as a whole. As a byproduct of the analysis, we argue that the vote intention series is a random walk. Moreover, even after house bias and sampling error are removed there remains real movement in public opinion during the election campaign. These findings suggest that candidates' campaigns cannot be dismissed as active forces in the final result.

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F7
Invited Session: Assessing Probabilistic Forecasts

Tuesday 11:15am-12:15pm Room: Gotham

Chair: Tilmann Gneiting
University of Washington, USA

Assessing Probabilistic Forecasts of Multivariate Quantities

Larissa Stanberry, Tilmann Gneiting, Eric P. Grimit, Leonhard Held, Nicholas A. Johnson
University of Washington, USA

A general framework for the verification of probabilistic forecasts of multivariate quantities is introduced. Various tools to assess calibration and sharpness are discussed and thoroughly studied on the simulated data. The proposed instruments include multivariate analogues of the probability integral transform and the verification rank histogram and the continuous ranked probability score. The use of these techniques in practice is illustrated on the short-range mesoscale ensemble forecasts of near-surface wind vectors over the North American Pacific Northwest. The data comes from the eight-member University of Washington mesoscale ensemble and encompasses the period from 31 October 2002 through 31 March 2004. The results at two individual stations, Olympia Airport, Washington, and Vancouver, British Columbia, are discussed in detail. Domain-wide comparison of forecast techniques indicates a strong effect of local topography and points at strengths and deficiencies of probabilistic forecasts of wind vectors in the US Pacific Northwest.

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Yet Another Model for the Federal Funds Rate Target - An Alternative Methodology and Forecast Evaluation

Kerstin Kehrle, Joachim Grammig
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Forecasts of key interest rates set by central banks are of paramount concern for investors and policy makers. It has recently been shown that forecasts of federal funds rate target, the most anticipated indicator of the Feds monetary policy stance, can be considerably improved when its evolution is modeled as a marked point process (MPP). This paper motivates an alternative MPP specification that combines autoregressive conditional hazard (ACH) and autoregressive conditional multinomial (ACM) model. We also propose a methodology to evaluate probability function forecasts of discrete time/discrete mark MPP models. The ACH-ACM qualifies as a sensible model for the federal funds rate target. It improves goodness of fit and point forecasts of the benchmark model. The forecast performance can be robustified by model averaging. Point forecast evaluations and probability function forecasts of the target issued by MPP models deliver favorable results.

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Probabilistic Forecasts, Calibration and Sharpness

Fadoua Balabdaoui
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Tilmann Gneiting, Adrian Raftrey
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Evaluation of a probabilistic forecast of a continuous weather variable; i.e., a forecast which takes the form of a predictive distribution, entails an extra difficulty as this evaluation is performed on the basis of the observations which are of a different nature. We suggest an approach which is based on the paradigm of maximizing sharpness of the probabilistic forecast subject to calibration. Calibration can be viewed as the analogue to consistency and hence reflects the concordance of the probabilistic forecast and the realisations of the forecasted weather variable. If several probabilistic forecasts are calibrated, then the best is the one which is the most concentrated, in other words the sharpest. We define various modes of sharpness and also propose, in view of this simple theoretical framework, diagnostic and study tools which are easy to implement for checking calibration and sharpness. Among these tools are the probability integral transform (PIT), the sharpness diagram and proper scoring rules.

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FM10
Contributed Session: Heirarchical Approaches

Tuesday 11:15am-12:15pm Room: Empire

Chair: Pankaj Sinha
University of Delhi, India

Covariance estimation for hierarchical forecasting

Roman A. Ahmed, Rob Hyndman
Monash University, Australia

Hierarchical forecasting involves simultaneously forecasting a number of time series that are arranged in a tree, with higher series formed as aggregates of those below them. A solution to the hierarchical forecasting problem involves prediction using a linear regression model with forecasts obtained by weighted linear combinations of the independent forecasts of each time series. The regression model contains an unknown covariance matrix that must be estimated. We examine the effect of four different estimates of the covariance matrix on hierarchical forecasting.

The first estimate is based on an assumption that means GLS prediction is equivalent to OLS prediction, and so the covariance matrix is simply an identity. The second estimate is a diagonal covariance matrix. Third, we use the empirical estimate of covariance from forecast errors. Finally we try a shrinkage estimate of the empirical covariance matrix.

We generate 200 random hierarchies with each hierarchy containing 37 series. We compare the forecast performance for each covariance estimator using the Wilcoxon test for mean absolute errors. The test results reveal that forecasting performance by OLS estimation is significantly worse than the three GLS-based approaches. We suggest using GLS estimation with a shrinkage estimate of the empirical covariance matrix for very large hierarchies.

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Hierarchical approach to criminality prediction

Dmitry V. Serebryakov, Igor V. Kuznetsov
Mikhail V. Rodkin, Oleg B. Uryadov
Russian Academy of Sciences

This work is concerned to criminality prediction methods based on universal behavior rules of complex nonlinear hierarchical systems. In the work we apply an approach used in earthquake prediction methods, namely, a special reoccurrence graph slopping behavior prior to a flash-up. Using a weekly criminality militia data from Yaroslavl we study dynamics of criminality and propose forecast algorithms for serious crime flash-up, which forecasting about 70% of flash-ups. All alarms occupy about 30% of whole time, and false alarms covered 8% of the alarm time. The meantime of alarm makes up about 3 weeks.

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Hierarchical Bayes Approach to Prediction in a Regression Model

Pankaj Sinha, Ashok Bansal
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In this paper a procedure is developed to derive predictive density function of a future observation, given the outcomes of informative experiments, under hierarchical priors for the vector parameter . The derived predictive density function is applied for prediction in a multiple regression model given in Fair (2002) to study the effect of fluctuations in economic variables on voting behavior in U.S. presidential election. Numerical illustrations suggest that the predictive performance of Fair's model is good under hierarchical Bayes setup, except for the 1992 election.

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BC9
Contributed Session: Inflation

Tuesday 11:15am-12:15pm Room: Duffy

Chair: Dennis W. Jansen
Texas A&M University, USA

Forecasting Inflation and Output: Comparing Data-Rich Models with Simple Rules

William Gavin, Kevin Kliesen
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Decision makers, both public and private, use forecasts of economic growth and inflation to make plans and implement policies. In many situations, reasonably good forecasts can be made with simple rules of thumb that are extrapolations of a single data series. In principle, information about other economic indicators should be useful in forecasting a particular series like inflation or output. Including too many variables makes a model unwieldy and not including enough can increase forecast error. A key problem is deciding which other series to include. Recently, studies have shown that Dynamic Factor Models (DFMs) may provide a general solution to this problem. The key is that these models use a large data set to extract a few common factors (thus, the term 'data-rich'). This paper uses a monthly DFM model to forecast inflation and output growth at horizons of 3, 12 and 24 months ahead. These forecasts are then compared to simple forecasting rules.

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UK inflation, output growth and their uncertainties: four variables, twelve links and many specifications

Menelaos Karanasos, Ning Zeng
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In this study, we investigate the link between UK inflation, growth and their respective uncertainties. The variables under consideration are inextricably linked. We construct a formulation of the constant conditional correlation GARCH model which allows for a bidirectional feedback between the two volatilities, which can be of either sign, positive or negative, and so no restriction is imposed. Another advantage of our approach is that several lags of the conditional variances are used as regressors in the mean equations. In our analysis, we show that not only uncertainty affects performance but the latter influences the former as well. The core findings that are quite robust to changes in the specification of the model are: (i) a bidirectional feedback between inflation and growth (ii) inflation has a positive impact on macroeconomic uncertainty and (iii) nominal variability affects real uncertainty positively. Some in-mean effects are found to be quite robust to the various specifications that were considered. Some others are found to be 'fragile' in the sense that either their statistical significance disappears or their sign changes when a different formulation is used. In particular, slight variations in the specification of the regressions appear to yield substantially different results for the influence of the two volatilities on output growth.

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Disaggregating to Forecast Inflation: A Functional Principal Components Approach

Dennis W. Jansen, Yongok Choi, Joon Park
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We propose a new method for forecasting inflation based on the distribution of the elements that make up the price index. We adopt a functional principal components approach, modeling the distribution of the elements of the CPI and transforming this model into its fourier representation, then modeling the fourier coefficients corresponding the the major principal components and forecasting these to eventually arrive at our inflation forecast. We investigate the usefulness of alternative bases, the method of handling possible nonstationarity of the principal components, and the importance of dissaggregation per se compared to our functional principal components approach. We demonstrate a substantional improvement in forecasting performance of our approach relative to autoregressive or vector autoregressive forecasts of the index itself.

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FM11
Contributed Session: Issues in Modelling

Tuesday 11:15am-12:15pm Room: Gramercy

Chair: Matthew L. Higgins
Western Michigan University, USA

Properties of Integer Autoregressive Moving Average Models

John E. Boylan, Maryam Mohammadipour
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Recently, there has been increasing interest in modelling stationary processes by discrete marginal distributions. Several models have been introduced for integer-valued time series, including Integer Autoregressive Moving Average (INARMA) models. While the stochastic properties of INAR(p) and INMA(q) processes are well developed in the literature, the same is not true for the general class of INARMA(p,q) processes. Therefore, this study focuses on identification, estimation of parameters and forecasting integer-valued time series that follow an INARMA(p,q) process. The theoretical Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) of the process have been derived, to establish a foundation for identification of the order of the process and it is proposed to use Conditional Least Squares (CLS) to estimate the parameters. Although some papers discuss the statistical aspects of INARMA models, fewer studies have been done regarding their practical application. The modelling and forecasting of processes such as intermittent demand promises to be a significant field of application for INARMA processes.

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A Threshod Dynamic Factor Model

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This paper introduces a threshold dynamic factor model for the analysis of vector time series with non-linear behavior. The model reduces the dimension of the system simplifying a vector threshold model of a large dimensin into a smaller dimension model. We propose a procedure for estimating common latent threshold factors that may explain the dynamic relationships between the group of variables. It is shown that the model is a special case of a conditional Gaussian state space model and can be estimated by the maximum likelihood method combining an EM algoithm with a grid search procedure. The model is applied to a system of flow rivers in a region of Colombia, South America. The procedure to model the vector time series consist of three steps. In the first one, we test whether there is evidence of nonlinearity in the river flows.We show that those rivers behave differently if the Southern Oscillation Index, SOI, exceeds a specific threshold value. The SOI is associated with the atmospheric component of the El Nino climatic event. In the second step we identify the number of common factors, resulting two common threshold factors. Finally, in the third step, we apply the proposed algorithm to esitmate the parameters of the model.

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Optimal Forecasting under a Mean Absolute Percentage Error Criterion

Matthew L. Higgins
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Mean absolute percentage error (MAPE) is a common criterion for evaluating forecasts. If the criterion is used because absolute percentage error (APE) reflects the forecast user's loss function, the forecast should be chosen to minimize expected APE. If the predictive density has nonzero mass at zero, we show that expected APE does not exist. In this case, the forecast MAPE provides a poor measure of forecast performance beyond the current sample. Assuming expected APE does exist, the optimal forecast will be biased because APE is asymmetric in the sign of the forecast error. To demonstrate this, we derive closed form expressions for the optimal predictor when the predictive density is uniform, Weibull, gamma and log-normal. When there is no closed form for the predictive density, we propose computing the optimal predictor by numerically minimizing a boot-strap estimate of the expected APE. Optimal forecasting under a MAPE criterion is illustrated by forecasting the number of weeks between changes in the Fed's federal funds rate target and by forecasting firm level sales data.

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NN2
Invited Session: NN3 Competition II

Tuesday 11:15am-12:15pm Room: Chelsea

Chair: Sven Crone
Lancaster University, UK

Bayesian Neural network for Time Series Prediction

Huanhuan Chen, Xin Yao
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Financial forecasting is an example of a signal processing problem which is challenging due to small sample sizes, high noise, non-stationarity, and non-linearity. In order to tackle these issues, Bayesian Neural network have been employed due to its ability to avoid overfitting by adaptive regularization and noise level estimation. Bayesian Neural network is a hierarchical Bayesian approach where there are hyperparameters which represent the relevance of the input features and the level of the noise. These relevance hyperparameters determine the range of variation for the parameters relating to a particular input and level of noise. By optimizing the hyperparameters iteratively, the optimal feature subsets and the noise level can be obtained. These abilities including automatic noise estimation and adaptive regularization are especially suitable for time series forecasting problems since proper regularization could partially resolve small sample sizes problems and automatic noise estimation could remove some noise in the time series and thus improve the performance of the forecaster. As a nonlinear forecaster, the performance of Bayesian neural network is not sensitive to non-stationary or non-linear time series.

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Forecasting using Neural Networks : A new approach to dynamic architecture network

Amaxopoulos Fotios, Georgia Papadaki
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This paper describes an entry to the NN3 Forecasting Competition. Neural Networks are a promising forecasting methodology which we seek to extend here. Their use tends to be dominated by the commonly used Feed Forward architecture with Back Propagation algorithm (FFBP). Here our intention is to construct a model that enhances the Dynamic Architecture Network (DAN2) by offering convergence to the global minimum in the shortest possible time. This led us to use the Conjugate Gradient Algorithm in conjunction with Simulated Annealing. This model is an efficient way to minimize forecasting error while discounting local minima. Our approach selects the optimal model inputs empirically, based on a pseudo out-of-sample forecasting performance, setting a maximum number of lagged inputs, according to a chosen error function. The data are the 111 time-series provided for the purpose of the NN3 Neural Forecasting Competition. As a benchmark we compared and contrasted the efficiency of our model's performance with a sequence of classical linear forecasting models (exponential smoothing average, ARIMA, ARARMA etc) and standard feed forward networks. Our results indicate a promising out-performance of the statistical methods mentioned even in problems involving long horizons and inadequate number of observations to forecast.

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Forecasting Time Series by SOFNN with Reinforcement Learning

Takashi Kuremoto, Masanao Obayashi, Kunikazu Kobayashi
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A self-organized fuzzy neural network (SOFNN) with a reinforcement learning algorithm called Stochastic Gradient Ascent (SGA) is proposed to forecast a set of 11 time series. The proposed system is confirmed to predict chaotic time series before, and is applied to predict each/every time series in NN3 forecasting competition modifying parameters of threshold of fuzzy neurons only. The training results are obviously effective and results of long-term prediction give convincible trend values in the future of time series.

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TS8
Contributed Session: Seasonality II

Tuesday 11:15am-12:15pm Room: Olmstead

Chair: James W. Taylor
Said Business School, UK

An investigation of neural networks in seasonal time series forecasting

Rohit Dhawan, Marcus O'Connor
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Although neural networks are widely used in time series forecasting, previous studies have questioned their ability of forecasting seasonal time series. This study investigates the efficacy of neural networks in forecasting monthly seasonal time series on simulated and empirical data. Results on artificial time series provide us with guidance in neural network methodology that we use for experiments on real data. Model specification and selection has been a major issue in the application of neural networks and may influence the ability of forecasting seasonal patterns. We investigate the effect of multiple architectural parameters and employ a cross-validation approach to select an optimized neural network architecture for each time series. We then perform out-of-sample tests on multiple time series across multiple horizons and evaluate these using appropriate error measures. Our results indicate that the performance of neural networks is at least comparable to that of statistical methods in forecasting seasonal time series. The analysis provides interesting insights into the sensitivity of neural network parameters such as hidden nodes, input nodes, and activation functions on their relative performance in forecasting seasonal time series. The findings also conform to the theory that neural networks can approximate any arbitrary pattern directly from the data.

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The Use of Seasonal Adjustment and Forecasting in the Office for National Statistics

Fida Hussain, Craig H. McLaren, Nigel Stuttard
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The UK Office for National Statistics (ONS) produces and publishes many important economic and social time series, often in seasonally adjusted form. The ONS has recently developed a software system which enables time series functions to be applied consistently across a wide range of time series. The system uses the X-12-ARIMA model-based seasonal adjustment package to carry out a number of time series functions including seasonal adjustment, forecasting and interpolation.

We describe the process used for seasonal adjustment and forecasting within the Office for National Statistics, particularly on the practical aspects of forecasting for official government time series. We present an empirical assessment of how the seasonal adjustment package X-12-ARIMA and the forthcoming new version X-13A-SEATS perform on a wide range of ONS time series. We consider future directions and issues for the analysis of time series at the ONS.

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Exponential Smoothing for Time Series with Multiple Seasonal Cycles

James W. Taylor
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Time series of intraday observations often consist of more than one seasonal cycle. Previous work adapted the Holt-Winters exponential smoothing method in order to capture the intraday and intraweek cycles in half-hourly electricity demand. This paper evaluates the usefulness of this double seasonal method for minute-by-minute demand observations for prediction from 10 to 30 minutes ahead. The results are compared with those from an approach using weather forecasts as input and a recently proposed alternative exponential smoothing formulation for multiple seasonal cycles. The paper also presents a triple seasonal adaptation of the Holt-Winters method in order to accommodate the additional intrayear cycle evident in a large sample of half-hourly data. For application to intraday call centre arrivals, a count data version of the double seasonal method is developed. The focus here is density forecasting with Poisson arrivals being the standard assumption. In addition, the paper considers a double seasonal quantile model estimated by quantile regression.

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T2
Invited Session: Telecom

Tuesday 11:15am-12:15pm Room: Soho

Chair: Mohsen Hamoudia
France Telecom

Estimating volatility in broadband rollout business cases

Nils Kristian Elnegaard
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A major shortcoming of the traditional net presnt value NPV methodology is the fact that it does not take into account the value of flexibility: how management would respond to the arrival of new information on costs, technology evolution, regulatory changes, competitors etc. The traditional NPV methodology assumes that corporate investments are ''now or never''. Real Options Analysis (ROA) incorporates managerial flexibility into the investment decision e.g. timing and scale of network deployment and is an add-on to the ''old'' NPV methodology. A central metric in ROA is the so-called volatility which is a measure of the uncertainty in project returns. In cases where no or few historical data are available as is the case when analyzing the business of new products and technologies volatility must be estimated by simulation. This paper describes how to estimate volatility using an example from the telecom world namely an incumbent telecom operators rollout of a fibre-to-the-cabinet network in an area with fierce competition from either a cable operator or a CLEC using local loop unbundling (LLU). Uncertainty is modeled by first estimating probability distributions for critical business case variables such as service adoption rate, cost evolution, ARPU and operational costs. The volatility is determined by performing Monte Carlo analyses of the logarithmic present value metric. In addition to the volatility itself, which is the standard deviation of the logarithmic present value metric found from this simulation, this approach also determines a measure of how each assumption variable is contributing to the volatility by using rank correlation. As adoption rates are often among the highest ranked uncertainty assumptions in telecommunications investment projects, reliable forecasts are instrumental in obtaining trustworthy estimates of the volatility.

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Long-term broadband forecasting models for the business market

Kjell Stordahl
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Long-term broadband forecasting models for the Western European market have been developed. A four parameter Logistic model has been used. The paper discusses two approaches. The first approach is based estimating all the parameters including the saturation level directly and then make the forecasts. The second approach includes more available information and estimates the saturation level in the model separately. After estimation of the saturation level, the last three parameters in the Logistic model are estimated. The saturation level for broadband accesses in the business market is a function of number of business units. A business unit is defined as part of a company situated on a specific geographical site. A business unit with many employees has potential to have more than one broadband access. A model is presented for estimation number of potential accesses per site as a function of number of employees. The number of accesses will in the long run depend on the evolution of different broadband technologies and the access capacity offered per access line. The number of business units is found in public statistics for all Western European countries. However, many business units are personal companies, mainly established because of tax reasons. These types of companies will not demand broadband accesses. Hence, the total number of business unites has to be adjusted by estimating potential broadband demanding business units. One problem with available broadband statistics like the OECD statistics and Point Topics statistics is lack of separation of broadband business accesses and broadband residential accesses. The separation of broadband business and residential statistics is based on statistics from the consultant company Idate for a shorter period. The last part of the paper shows the long-term broadband penetration forecasts for Western Europe for both the residential and the business market.

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An Econometric model for Forecasting the ICT Business Market using the Simultaneous Multi-Equation Modeling

Mohsen Hamoudia
France Telecom

The ICT market has seen tremendous changes in Europe since 1998 (excepted in UK). New technologies, more aggressive competition, full deregulation, new consumer behavior and expectations, new players and multiple substitution effects have caused increasing complexity and difficulties in modelling and forecasting products and services. These new constraints were not adequalety integrated in the modelling and forecasting processes and lead to inconsistent and inaccurate forecasts and shifts in demand. Following our preliminary works on the Residential market started last year (presented in ISF2006, Santander), we will present in this paper, the framework and description of a forecasting system based on a system of simultaneous multiple regression equations establishing multiple linkages between various ICT products and services for Business market. This system expresses various given Telecom variables and markets (Traffic, Sales, Bandwidth, Mobile, Fixed, Data, Pbx, Lan, ...), and the independent variables (economic and industry drivers, prices, technology changes, ...) as a function of each other plus other explanatory variables. We will show why and how this approach could be more adequated to the ICT market in which the majority of the variables are interdependant of each other.

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FM12
Contributed Session: Trend Methods

Tuesday 11:15am-12:15pm Room: Herald

Chair: Everette S. Gardner, Jr.
University of Houston, USA

Prediction of world regional contraceptive prevalence rates based on extrapolation

Jose Antonio Ortega
United Nations, USA

Contraceptive prevalence rates play an important role in the assessment of fertility trends and demand for contraceptives. Previous exercises in projecting future contraceptive prevalence were conditional forecasts based on existing fertility forecasts. In contrast, in this paper we provide forecasts of contraceptive prevalence rates based solely on previous trends in contraceptive prevalence. We make use of all the available data points for the different countries of the world since 1980. Region-specific econometric models provide the basis for extrapolation of current trends at the country level and computation of regional contraceptive prevalence rates for the period 2005 to 2025. The contraceptive prevalence forecasts are then compared within the proximate determinants framework to the World Population Prospects fertility forecasts so that it can be assessed how fast the rest of proximate determinants would need to change in order to match the current fertility recasts. This provides an interesting input for future revisions of fertility forecasts.

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Trend damping in judgmental forecasting: Effects of series acceleration, noise level and context

Nigel Harvey, Stian Reimers
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The term ‘trend damping’ describes the phenomenon in which future points on an increasing time series are underestimated, and those on a decreasing time series are overestimated. In Experiment 1, we used positively trended power-law series, which varied in their acceleration: two had negative acceleration, one was linear, and two had positive acceleration. This factor was crossed, within subjects, with two levels of Gaussian noise in the trend. We found that people’s judgments underestimated the acceleration of the trends. Thus, people underestimated positively accelerated trends (damping) and overestimated negatively accelerated trends (‘anti-damping’). Linear trends were not systematically under- or over-estimated. Noise increased these effects significantly. The ‘anti-damping’ in the negatively accelerated curves with a positive trend suggests that series acceleration, as well as gradient, has a strong effect on trend damping. Human judgement is highly sensitive to contextual variables. Thus trend damping may reflect participants’ regression towards the ‘average’ trend they have experienced within an experiment, rather than an ‘absolute’ underestimation of time series trends. We tested this by comparing trend damping in two different trend contexts. In Experiment 2, we used 8 different trend functions that varied in their acceleration (A1, smallest acceleration A8, largest acceleration). There were two between-subjects conditions. In the Low Context condition, participants saw A1, A2, A3, A4, A6; in the High Context condition, participants saw A4, A5, A6, A7, A8. We compared estimates of series A4 and A6 in the two conditions. Participants showed trend damping in both conditions. However, trend damping was significantly larger in the Low Context condition than in the High Context condition. We replicated this finding in Experiment 3 using 8 linear functions with differing gradients. These findings suggest that trend damping does not arise solely as a context effect, but that context can influence trend damping magnitude.

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Exponential smoothing in the telecommunications data

Everette S. Gardner, Jr.
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Exponential smoothing methods gave poor forecast accuracy in Fildes et al.'s study of telecommunications time series. We reexamine this study and show that the accuracy of the Holt and damped trend methods can be improved by trimming the time series to eliminate irrelevant early data, fitting the methods to minimize the MAD rather than the MSE, and optimizing the parameters. Contrary to Fildes et al., we show that the damped trend is more accurate than Holt's method. Because most of the telecommunications series display steady trends, we test the Theta method of forecasting and a closely related method, simple exponential smoothing with drift. The Theta method proves disappointing, but simple exponential smoothing with drift is the best smoothing method for this data, giving about the same accuracy as the robust trend.

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BC10
Contributed Session: Term Structure

Tuesday 11:15am-12:15pm Room: Hudson

Chair: Antonio Diez de los Rios
Bank of Canada

Predicting the Term Structure of Interest Rates

Francesco Ravazzolo, Michiel Pooter, Dick van Dijk
Erasmus University Rotterdam, The Netherlands

In this study we forecast future values of U.S. Treasury zero coupon bond yields. We analyze a wide range of models that have been used in the literature to predict the term structure of interest rates. We assess parameter uncertainty by examining the added value of using Bayesian inference compared to frequentist estimation techniques, and model uncertainty by combining forecasts from individual models. Following current literature we also investigate the benefits of incorporating macroeconomic information in yield curve models. Our results show that adding macroeconomic variables is very beneficial for improving the out-of-sample forecasting performance of individual models. Despite this, the predictive accuracy of these models varies over time considerably, irrespective of using the Bayesian or frequentist approach. We show that mitigating model uncertainty by combining forecasts leads to substantial gains in forecasting performance, especially when applying Bayesian model averaging.

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Forecasting the term structure of interest rates: The role of macroeconomic factors and learning

Thomas Laubach
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Affine term structure models (especially the ‘‘essentially affine’’ models in which both bond yields and the market price of risk are linear processes of an underlying state) have become popular tools for modeling the term structure of government bonds. Several authors have argued that affine models in which (some of) the factors capture the state of the economy, such as real activity and inflation, provide a good fit of the term structure and thereby a better understanding of its macroeconomic determinants. Less clear is whether the restrictions imposed by this class of models, i.e. the affine no-arbitrage structure of yields and the identification of the state with macroeconomic conditions, are helpful in forecasting the term structure. This paper conducts a comparison of out-of-sample forecast performance between affine models with or without macro factors and the extended Nelson-Siegel model of Diebold and Li. Particular attention is paid to the role of time-variation in affine models with macro factors. Whereas existing models in this class impose the (implausible) restriction that relationships between the macroeconomy and interest rates are time-invariant, this paper considers an affine model in which agents revise their beliefs about the macroeconomy using a simple recursive learning mechanism.

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Can Affine Term Structure Models Help Us Predict Exchange Rates?

Antonio Diez de los Rios
Bank of Canada

This paper proposes an arbitrage-free model of the joint behaviour of interest and exchange rates whose exchange rate forecasts outperform those produced by a random-walk model, a vector autoregression on the forward premiums and the rate of depreciation, and the standard forward premium regression. In addition, the model is able to reproduce the forward premium puzzle.

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FM13
Featured Talk

Tuesday 1:15pm-2:15pm Room: Olmstead

Chair: Jose Mario Quintana
Bayesian Efficient Strategic Trading, USA

Forecasting, science and macroeconomics

Arnold Zellner
University of Chicago, USA
UC Berkeley, USA

For many years, the relationship of forecasting, science and macroeconomics has been unclear and somewhat controversial. Some assert that forecasting is an art, not a science. Others believe that macroeconomics with its mathematical models that are not usually subjected to strenuous predictive testing is not a science but a field of mathematics. And then too, there is some controversy about how to define the word science. In this talk, science will be defined and related to forecasting and macroeconomic activities with concrete examples to illustrate general points. What emerges is that forecasting models play a central role in the science of macroeconomics and in many other areas of science, as emphasized in early work of Milton Friedman and in the structural econometric, time series analysis (SEMTSA) approach put forward and applied by Zellner and Palm, Espasa, and others that will be described along with examples from the literature. It is concluded that forecasting plays a central role in the sciences and further recognition of this fact will be very beneficial for forecasting, forecasters and the progress of the sciences.

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Arnold Zellner is H.G.B Alexander Distinguished Service Professor Emeritus of Economics and Statistics at the Graduate School of Business of the University of Chicago, and Adjunct Professor, Department of Agriculture and Resource Economics, UC Berkeley. He is a past president of the American Statistical Association, the founding President of the International Society of Bayesian Analysis, Fellow of the Econometric Society, the American Statistical Association and IIF, and founding editor of the*Journal of Econometrics* and the *Journal of Business and Economic Statistics.* His work has deeply influenced econometrics and statistics, in particular modern time series analysis, forecasting and Bayesian methodology.

FM14
Contributed Session: Comarisons of Forecasting Methods II

Tuesday 1:15pm-2:15pm Room: Duffy

Chair: George Athanasopoulos
Monash University

Parametric vs. Nonparametric Forecasting for Intermittent Demand Items: An Empirical Investigation

Aris A. Syntetos, M. Zied Babai
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Intermittent demand patterns are built from constituent elements (demand sizes and intervals) and they are very difficult to forecast. Crostons method and its variants (in conjunction with an appropriate distribution) have been reported to offer tangible benefits to stockists forecasting intermittent demand. Nevertheless, there are certainly some restrictions regarding the degree of lumpiness that may be dealt with effectively by any parametric distribution. In addition to the average inter-demand interval, the coefficient of variation of demand sizes has been shown in the literature to be very important from a forecasting perspective. However, as the data become more erratic, the true demand size distribution may not comply with any standard theoretical distribution. This challenges the effectiveness of any parametric approach. When SKUs exhibit a lumpy demand pattern one could argue that only non-parametric approaches (that do not rely upon any underlying distributional assumption) may provide opportunities for further improvements in this area. Some bootstrapping approaches have been proposed in the literature to deal with intermittent demands. The relevant studies claimed improvements in forecasting accuracy achieved over parametric approaches but nevertheless they have also been criticized in terms of their methodological arrangements and experimental structure. What is agreed upon currently in the academic literature is the need to broaden the base of empirical evidence in this field. In particular a comparison between some recently developed adaptations of Crostons method (in conjunction with an appropriate distribution) with some bootstrapping approaches should prove to be beneficial from both theoretical and practitioner perspectives. Such a comparison constitutes the focus of our research. More specifically we compare, by means of an empirical experimentation on a large demand data set, the forecasting and stock control performance of various parametric and non-parametric methodologies. The results allow insight to be gained on the relative benefits of those approaches.

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Neurons, Box-Jenkins and Fibonacci: a comparison of ARIMA modelling, Artificial Neural Networks and Elliott Forecasting for scrap price forecasting

Jonathan Aylen, Kevin Albertson
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A wide range of alternative time series techniques are available to forecast data such as commodity prices. This paper compares three techniques: ARIMA modelling; Neural Networks and a novel approach, Elliott Forecasting. These are used for practical forecasting of quarterly scrap prices for a leading European steel company. A conventional approach to forecasting using ARIMA models is outlined. Two alternative forecasting techniques are compared with this benchmark. The first uses artificial neural networks to simulate the scrap market and forecast future prices. This seems to be successful at replicating the recent behaviour of the scrap market and provides plausible forecasts. The second technique uses Elliott Forecasting to analyse and project scrap price movements. This is less successful as these charting techniques do not fit the recent behaviour of the market. Nor do Elliott Forecasting techniques provide plausible forecasts.

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VARMA versus VAR for Macroeconomic Forecasting

George Athanasopoulos
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Farshid Vahid
Australian National University

In this paper, we argue that there is no compelling reason for restricting the class of multivariate models considered for macroeconomic forecasting to VARs, given the recent advances in VARMA modelling methodology and improvements in computing power. To support this claim, we use real macroeconomic data and compare the forecasting performance of VARMA and VAR models. As a first example, we compile many trivariate sets of monthly macroeconomic variables and choose fifty in which VARs forecast better than univariate ARs. We fit VAR and VARMA models to them, using only one portion of the available sample for estimation and holding the rest of the sample for a forecast comparison. Using the estimated models, we forecast these variables 1 to 15 steps into the future throughout the forecast period. We then use several measures of forecast accuracy to compare the performance of the VARMA and VAR models. In another example, we use quarterly US GDP growth, inflation, short term interest rate and the term spread. These four macroeconomic variables have featured prominently in the recent empirical literature. We compare the performance of VARMA, VAR and univariate AR models in forecasting these variables. Finally, taking the estimated VARMA model for these four variables as a base data generating process, we perform a Monte Carlo analysis and explore what feature of the data is most responsible for the better forecasting performance of VARMA models relative to VARs.

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BC11
Contributed Session: Interest Rates

Tuesday 1:15pm-2:15pm Room: Hudson

Chair: Helgi Tomasson
University of Iceland

Bayesian Model Selection for Structural Break Models

Jeremy Piger
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Andrew Levin
Federal Reserve Board), USA

We take a Bayesian approach to model selection in regression models with structural breaks in conditional mean and residual variance parameters. A novel feature of our approach is that it does not assume knowledge of the parameter subset that undergoes structural breaks, but instead conducts model selection jointly over the number of structural breaks and the subset of the parameter vector that changes at each break date. Simulation experiments demonstrate that conducting this joint model selection can be quite important in practice for the detection of structural breaks. We apply the proposed model selection procedure to characterize structural breaks in the parameters of an autoregressive model for post-war U.S. inflation. We find important changes in both residual variance and conditional mean parameters, the latter of which is revealed only upon conducting the joint model selection procedure developed here.

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Alternative Estimates of a Structural Model of the Relationship among Interest Rates

Albert E. DePrince, Jr.
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This study reports alternative estimation results for a large-scale structural model of interest rates. The author has been a participant in the Blue Chip Financial Survey since its inception in 1981, and this is the latest version of the model used to generate the forecasts for that survey and other purposes. The model begins with a base rate (in this version, the federal funds rate) from which rates along the U.S. Treasury yield curve are linked by simple but very effective term structure relationships. A large number of other rates are linked to the Treasury yield curve through various relationships designed to capture the time-series characteristics of the quality spreads. Presently, the model is a system of 55 interest rates, covering the Treasury yield curve; various commercial paper, finance paper, large CDs, and Eurodollar deposit rates; various swap rates, various primary-market and secondary-market mortgage rates, various retail deposit rates, consumer loan rates, and cost of funds indexes.The system is estimated using monthly data over the 1986-2006 sample period. Alternative system estimation methods are used to estimate the 55 equations, results are compared, and one estimation method is chosen as superior to the others. Forecasts are generated from those estimation results in which the federal funds rate is an exogenous policy variable. Alternative policy paths are used to illustrate effects on the forecasts of the yield curve and quality spreads. A modified version of the system is developed that incorporates a simple Taylor rule to generate the federal funds rate over the simulation horizon. Simulations here depend upon the nature of the Taylor Rule and the inflation-generating process. Finally, the system can be judgmentally modified to account for presumed changes in its structure based upon the unique characteristics of a given interest-rate cycle.

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Surveillance methods of continuous-time data

Helgi Tomasson
University of Iceland

In modern mathematical-finance theory continuous-time models is a powerful analytical tool in formalizing financial problems. This paper is an effort in combining the continuous-time models and on-line data streams. The features of interest rate processes are described by estimating parameters in simple diffusion models like CKLS. Hypothetical data on transactions are collected electronically and interpreted as observations of a continuous-time process. Numerical approximation of the likelihood allows implementation of surveillance statistics such as exponential-CUSUM and Shiryaev-Roberts. Use of computer programs that calculate these statistics for the CKLS model is illustrated.

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BC12
Invited Session: Macroeconomic Forecasting

Tuesday 1:15pm-2:15pm Room: Gotham

Chair: Herman Stekler
The George Washington University, USA

Cyclical accuracy of macroeconometric models - a multivariate perspective

Ullrich Heilemann
Universitat Leipzig, Germany

Forecast accuracy is usually tested variable by variable, even if the forecasts have been made or are presented jointly. As a consequence, conclusions about forecast accuracy are possible only variable by variable. A comparison of complete forecasts is difficult if there is no joint loss function. A solution to this is to measure how good a multivariate forecast meets a pre-established multivariate scheme (implying some kind of loss function). The scheme employed here is a 4-phase scheme of the German business cycle (growth cycle), developed by Meyer/Weinberg (1975) that has been updated several times. (Heilemann, Schuhr, Blaschzik 2007) It uses 12 variables for cyclical classification of Germany's macroeconomic development with linear multivariate discriminant analysis (LDA). A comparison of the ''actual'' classification with that derived from inserting the corresponding variables into the LDA-based classification functions informs about the cyclical accuracy of the forecast. This is illustrated with a number of ex post and ex ante results of the RWI-business cycle model that explains most of the classifying variables (Heilemann 2004).

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Individual and group characteristics as determinants of forecast performance: evidence from a survey of US financial forecasters

Roy Batchelor
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This paper investigates the relationship between forecaster characteristics and the quality of forecasts made by a panel of US financial forecasters who contributed to the Blue Chip Financial Forecasts service. Information about the forecasters was elicited from a survey conducted among the panellists. The survey asks for details of age, education, experience and preferred forecasting methods, and also asks about the forecast process whether conducted at an individual or group level, for example, and who the forecaster regards as the main clientele for the forecasts. We test for the influence of these characteristics on forecast bias, accuracy, and market timing ability. We also investigate whether the consensus forecast can be improved by weighting forecasts according to diversity of forecaster characteristics.

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An Evaluation of Forecasts of the FED

Frederick L. Joutz, H. O. Stekler
The George Washington University, USA

Evaluations of macroeconomic forecasts have yielded two mutually inconsistent results: there are systematic errors and the null of unbiasedness or rationality is frequently not rejected. The forecasts of the Fed show these same tendencies. This paper examines the methodology that is used to test for unbiasedness and shows that a modification of the statistical procedure reconciles these results. We next explore the relationships between the real GDP, inflation, and unemployment forecasts to determine whether there is unexploited information in these relationships.

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FM15
Contributed Session: Performance and Classification

Tuesday 1:15pm-2:15pm Room: Herald

Chair: Aard den Reijer
De Nederlandsche Bank, The Netherlands

Predicting long term performance by assessing sustainable competitive advantage

Miguel A. Arino
IESE Business School, Spain

Miguel A. Canela, Roberto Garcia-Castro
Universidad de BArcelona, Spain

We present in this paper a way to assess long term performance of a company. The model is based on the fact that evaluating the sustained competitive advantage of a firm exclusively according to its superior economic performance sustained for a period of time (as it is normally evaluated) can be, in fact, hiding alternative forms of competition and competitive advantage generation. We propose a new way of measuring sustainable competitive advantage. This new approach can help managers and investors to assess and forecast with greater certainty the long-term future performance of a company. It goes beyond the traditional performance measures, taking into account, not only the performance of the company, but also the covariance between this performance and that of the industry at which the company belongs. We apply this new measure to different companies, discussing the results obtained.

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Classification for Time Series based on Functional Depth

Juan Romo, Andres Alonso, David Casado, Sara Lopez-Pintado
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Classifying time series is an important task in different real situations. We propose a frequency domain technique based on the integrated periodogram that turns the time series problem into a functional data problem. A series is assigned to a class after comparing distances between its integrated periodogram and the mean of the integrated periodograms of each group. We use the L1 distance between functions. Although the periodogram is only defined for stationary series, we shall consider that series are locally approximately stationary in order to classify nonstationary time series. We shall split them into different blocks and compute the periodogram for each block. Since the mean of each group is highly sensitive to outliers, we replace it by the corresponding trimmed mean, where the trimming is based on the statistical depth extended to functional data by Lopez-Pintado and Romo (2006). We evaluate our proposal with simulated stationary and nonstationary series. After running the simulations with uncontaminated series, we contaminate them. We also check the procedure with a benchmark real data set. Our methods provides small error rates, robustness and a good computational behaviour; this makes it very suitable to classify very long time series.

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The Dutch business cycle: which indicators should we monitor?

Aard den Reijer
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In this study we construct a business cycle indicator for the Netherlands. The Christiano-Fitzgerald band-pass filter is employed to isolate the cycle using the definition of business cycle frequencies as waves with lengths longer than 3 years and shorter than 11 years. The main advantage of band-pass filtering is the unambiguous concept of a business cycle, to which the filtered approximation will eventually converge as more and more observations become available. The coincident business cycle index is based on industrial production, household consumption and staffing employment. These three variables represent key macroeconomic developments, which are also analysed by both the CEPR and NBER dating committees. For the indicator to be useful in practice, a timely update and therefore a limited publication delay is a crucial constraint. The composite leading index consists of eleven indicators representing different sectors in the economy: three financial series, four business and consumer surveys and four real activity variables, of which two supply- and two demand-related.

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FM16
Contributed Session: Supply Chain

Tuesday 1:15pm-2:15pm Room: Empire

Chair: Phillip M. Yelland
Sun Microsystems, USA

Uncertainty Principles in Downstream Demand Inference

Mohammad M. Ali, John Boylan
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Effective Inventory Management in supply chains requires coordination among the various channel members. Many companies are adopting strategies that enable Demand Information Sharing (DIS) between the downstream and the upstream links in the supply chain. Some authors have claimed that DIS can result in cost savings due to increased forecast accuracy. Recently a steady stream of research has identified mathematical relationships between demands and orders at any link in the supply chain. Based on these relationships and strict model assumptions, it has been suggested that the upstream member can infer the demand at the downstream member from their orders. If this is so, no reduction in forecasting error variance and thus in inventory costs would result from sharing demand information. In this paper, we argue that real world modelling requires less restrictive assumptions. Using a two-stage supply chain model where the demand is represented by an ARIMA process, we quantify the value of DIS when the supply chain members employ optimal and non-optimal forecasting methods. We investigate four models that have been developed to allow a staged relaxation of model assumptions. In all four models, we assess the accuracy with which demand at the downstream link can be inferred and the effect of the accuracy on the inventory costs. Our results show that as we adopt more realistic supply chain models, with less restrictive assumptions, there is less scope for the upstream member to accurately infer the demand at the downstream link, resulting in increasing average inventory holdings. We compare this with the scenario where the links share demand information for their lead-time forecasting. Based on these results, we quantify the potential benefits of DIS among supply chain members. Our study shows that sharing demand information in forecasting and ordering decisions results in reduced inventory costs.

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Integration of exponential smoothing and inventory control theory

Ralph D. Snyder
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Predictions of demand level and risk are critical inputs to inventory control decisions. Typically based on exponential smoothing, these methods implicitly assume that demands are non-stationary. Yet most standard inventory theory used in practice is predicated on the assumption that demands are generated by a stationary stochastic process. This presentation will be concerned with the proper reconciliation of these methods.

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Bayesian Forecasting for Supply Chain Management at Sun Microsystems: Reprise

Phillip M. Yelland
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This talk updates a presentation given at ISF 2005, which introduced a suite of statistical forecasting software developed for supply chain management at Sun Microsystems. In the earlier presentation, I described how the software uses Bayesian state-space time series models to combine salesforce and marketing estimates with actual sales figures, producing quarterly demand estimates for a range of computer products. This talk concentrates on the improvements made to the software in the intervening two years. Technical improvements include a new statistical model with a greatly simplified state structure but a more realistic account of seasonal effects. This new model also incorporates two separate models in the original (one for quarterly series, the other for cumulative weekly demand in a quarter), which makes for simpler calibration using Markov chain Monte Carlo (MCMC) simulation alone, where the original system used both MCMC and importance sampling. Experience in deploying the software, and feedback from its users gave rise to other improvements: for example, the new system offers a mechanism for deriving priors automatically from sales force forecasts using robust non-linear regression. On a pragmatic level, the software has been reimplemented more-or-less entirely in the open-source statistical programming environment R, and Ill try to draw out some lessons concerning the use of R for the development of mission-critical applications.

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TO1
Contributed Session: Tourism I

Tuesday 1:15pm-2:15pm Room: Soho

Chair: Miriam Scaglione
Institut Economie and Tourisme, Switzerland

Comparison of Periodic and Non-Periodic Neural Network Tourism Forecasts

Hubert P. Fernando, Jo Vu, Lindsay W. Turner
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Artificial neural networks have been used extensively as a forecasting tool and more recently for forecasting tourism flows. This paper consists of a comparison of three, univariate artificial neural network multi-layer perceptron (MLP) forecasting models using monthly data to determine which of the three empirical neural network models, periodic, partial periodic or non-periodic, would provide the best forecast for tourist arrivals data. The paper addresses the issue of whether a neural network model using periodic data would capture the seasonality of a time series better than a model using non-periodic data. The non-periodic model uses the 12 previous monthly arrivals as inputs. The output is the arrivals figure of the following month. The partial periodic model uses tourist arrivals data lagged by 12, 24 and 36 months as inputs. In this model each month's arrivals are matched against the three previous years' (lagged) arrivals of the same calendar month. The use of lagged series relieves the model of having to capture much of the seasonal component. The third MLP model used is the periodic model. The inputs to this model are the tourist arrivals series of a specific month. The output is the arrivals figure of that month in the forecast horizon. The variable being forecast is tourist arrivals to Japan. Monthly tourist arrivals from Australia, China, France, Germany, Korea, Singapore, Taiwan, UK, the USA and total arrivals from all countries, from January 1978 to December 2001, are used to forecast arrivals for the 24 month period from January 2002 to December 2003. The findings of this study are that the partial periodic model is best suited for forecasting tourist arrivals and that the non-periodic model is superior to the periodic model. This indicates that neural networks capture tourism seasonality where seasonal values may not be independent of each other.

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A Web-based tourism demand forecasting system for Hong Kong

Haiyan Song, Stephen F. Witt, Alina X.Y. Zhang
The Hong Kong Polytechnic University

Tourism demand is the foundation on which all tourism-related business decisions ultimately rest. A tourism demand forecasting system (TDFS) is an information system consisting of a set of computer-based modules or components that supports tourism demand forecasting. This paper proposes to establish a Web-based TDFS which is able to provide better information sharing and communication and allow prompt contributions of experts engaged in tourism demand forecasting. The system has been innovatively designed to integrate judgmental adjustment with quantitative tourism demand forecasts. The conceptual framework and detailed components of the proposed Web-based TDFS, which employs a three-tiered client-server architecture, are illustrated. Following the modular software architecture, the three-tiered architecture has great flexibility, reusability and reliability. The Web-based TDFS has been developed using the ActiveX technology and applied in Hong Kong.

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Estimating tourist numbers in a resort on the basis of indirect indicators using reconciliation methods and Structural Time Series

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Tourism is an economic sector in which measurements are often unreliable (cf. Smith 1995, p. 15). Nevertheless, a measurement such as the estimated number of tourists in a region or in a particular resort is important not only for planning future investments, but also on the macroeconomic level (conjectural studies). In Switzerland, hotels are obliged by law to declare the number of overnights by client according to nationality. But this is only part of the story. In some destinations, overnights in hotels represent less than the 10% of the total tourist impact. Self-catering tourists, owners of secondary, holiday homes, and trippers (tourists coming to the resort only for the day, without spending the night) represent the greater part of tourist numbers. The present research proposes a method for estimating the total tourism impact in a resort on a monthly basis using indirect indicators like the weight of garbage collected, the flow of waste water, the volume of sales in the most important supermarkets, and the automatic counting of traffic on access roads. All these types of data are available on a monthly basis. The data available on tourism raises several problems: firstly, there is the seasonal factor. Whereas hotel overnights are obtainable on a monthly basis, those relating to self-catering accommodation and owners of secondary home are available only yearly. In order to estimate monthly evolution, methods such as those owed to Professor Camilo Dagum (Dagum and Cholette 2006) and (Quenneville, Fortiery et al. 2006) are used. Secondly, the data regarding secondary home owners are not reliable, and the same methods are used in order to evaluate the reliability as a reconciliation method. Thirdly, there are no statistics available concerning day trippers. The process of estimation proposed in this research uses the following steps. Once figures for overnights are estimated on a monthly basis, structural times series models (Harvey 1990) using as indigenous variables indirect indicators other than transportation data, and as exogenous variable total overnights (i.e. hotels, self-catering accommodation and secondary home owners) give an estimate of the impact of day trippers as a residue. Finally, dynamic analysis (nowcasting) of total numbers is carried out in comparison with transportation data on the basis of a bi-variated structural time series model in order asses the reliability of the estimate.

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F8
Featured Talk

Tuesday 2:15pm-3:15pm Room: Gotham

Chair: Paul Goodwin
University of Bath, UK

Financial forecasting and valuation: accounting for the future

Stephen Penman
Columbia University, USA

This talk outlines how accounting is incorporated into forecasting and equity valuation. First, it shows how alternative accounting methods -- including cash accounting, historical cost accounting, and fair value accounting dictate different forecasting and valuation approaches, and how one adapts to mixed measurement and accounting quality issues associated with official GAAP accounting. Second, the talk also shows how the fixed, structural relations that govern the accounting framework can be appropriated to structure the forecasting and valuation task.

The talk adopts the perspective that valuation is really a matter of accounting for value. Equity value is based on expected future payoffs and accounting numbers are typically seen as providing information for forecasting those payoffs. But a primary feature of accounting (and valuation) is the specification of the payoffs to be forecasted, whether it be future cash (cash accounting) or future earnings and book values (accrual accounting), with the latter involving an array of alternatives depending on the accrual accounting rules adopted. That specification, in turn, identifies the form of the current, reported accounting numbers that forecast payoffs, for those numbers are realizations of forecasted payoffs. Given the inter-temporal nature of accounting, accounting specification also determines how current accounting numbers transition to the future which, of course, is the issue in forecasting.

The discussion has implications not only for forecasting and equity analysis but for setting accounting standards for reporting information to equity investors.

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Stephen H. Penmanis George O. May Professor of Accounting and Morgan Stanley Dean Witter Research Scholar, Columbia Business School. Prior to his appointment at Columbia, he held the L. H. Penney Chair at the University of California, Berkeley. He has received the AICPA/American Accounting Association Award, and is author of *Financial Statement Analysis and Security Valuation*, published in 2001 by Irwin/McGraw-Hill, for which he received the Wildman Medal. Professor Penman serves as co-director of the Center for Excellence in Accounting and Security Analysis at the Columbia Business School and also as managing editor of the *Review of Accounting Studies*.

O5
Contributed Session: Demographic Forecasting

Tuesday 2:15pm-3:15pm Room: Empire

Chair: Rocio Sanchez-Mangas
Universidad Autonoma de Madrid, Spain

An evaluation of K-12 school enrolment projections in British Columbia

Heather Padula
Ministry of Finance, British Columbia, Canada

Funding levels in the K-12 Education system in British Columbia is driven primarily by student enrolment. In 2007/08 spending on K-12 Education is expected to be almost twenty per cent of the overall provincial budget, second only to Health spending. Accurate estimates of future enrolments are key from a budgeting and planning perspective. This paper examines the method of enrolment projection in British Columbia and evaluates historical performance. Alternative methods of enrolment projection and current practices in other jurisdictions are also examined.

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The Effect of Immigration on the Momentum of Population Growth

Angi Roesch
FOM University of Applied Sciences, Germany

The ageing of populations is a universal trend, which is supposed to affect, sooner or later, all parts of the world during this century. In many countries, immigration has become vital to mitigate the impact of falling birth rates. The concept of population momentum provides insights into prospects for the delay of demographic change. We consider an age-structured population of natives and immigrants. Its dynamics is described by a discrete-time Leslie-type projection model which allows for a time-varying native and immigrant behaviour. Immigrants may gradually adopt native maternity rates. It is shown how immigration may effect population momentum. An age- and state-specific concept of momentum is developed, analysed, and applied to real-world populations. Consequences of migration policies, in the light of our model, are pointed out.

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Balancing family and work: the effect of cash benefits for working mothers

Rocio Sanchez-Mangas
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Virginia Sanchez-Marcos
Universidad de Cantabria, Spain

The aim of this paper is to measure the potential effect of a family policy introduced in Spain in 2003 that provides working mothers with a monthly cash benefit of 100 euros per child aged under 3 years. We explore the effect of the policy on eligible women's labour market participation. In the tradition of the policy evaluation literature we use a difference-in-differences-in-differences (DDD) estimation approach. Our results support a potential positive and significant effect of the policy. We find that since the implementation of the policy the labour market participation rate for mothers of children aged under 3 has undergone an increase 1.714 percentage points higher than for non-policy-eligible females. This represents 5.244% of their average labour market participation in 2002, the year before the policy was implemented. We find that the effect is not homogeneous across educational groups, and, in particular, there is a stronger potential positive effect for women who have only completed elementary or high school education than for college graduated females. This analysis is relevant for the design of family policies aimed at increasing female labour market participation as it allows the use of counterfactual experiments to forecast the effects of such policies.

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FM17
Contributed Session: Exponential Smoothing

Tuesday 2:15pm-3:15pm Room: Soho

Chair: Anne Koehler
Miami University, USA

Some evidence of the constrained damped Holt's method performance on the MH competition data

Natasha Atanackov
Belgrade University, Serbia

John Boylan
Buckinghamshire Chilterns University College, UK

Based on the results of previous M-competitions, the damped Holt's forecasting method was among the best performing methods when universally applied on the entire dataset, without examining whether the series exhibit an underlying trend or not. In this paper, a model-based approach to forecasting is adopted, following a Multiple Source of Error formulation. By examining the optimality properties of damped Holt's method for a damped trend mathematical model, a constrained set of smoothing parameters and the damping parameter phi may be obtained to minimise Mean Square Error. The objective of this paper is to examine whether the constrained set of parameters will improve, in terms of forecast accuracy, upon the ordinary damped Holt's method (when all parameters are chosen from the interval between 0 and 1) when using a subset of the MH competition data. Therefore, for selected damping parameters, from 0 to 1, a set of smoothing parameters alpha and beta was derived and tested. Throughout the empirical analysis, a rolling origin was applied and the results are presented using two accuracy measures: the Mean Absolute Percentage Error (MAPE) and symmetric Mean Absolute Percentage Error (sMAPE). The time series under concern are divided in two parts: the estimation period and out-of-sample period, during which the methods parameters were not recalibrated. Forecasts are updated at every period relevant for the performance testing. The evidence has shown that a small but consistent improvement of forecast accuracy may be achieved by constraining the damped Holt's method parameters.

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Exponential Smoothing for Series with Long-Run Trends

Dan Williams
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Don Miller

Forecasters often encounter situations in which the local pattern of a time series is not expected to persist over the forecasting horizon. Since exponential smoothing models emphasize recent behavior, their forecasts may not be appropriate over a forecasting horizon of say a year or more. A common example is an economic series exhibiting persistent long-run trend with cyclic variation. In this paper, we develop an extended exponential smoothing model in which the local trend line projected by exponential smoothing converges asymptotically to a future trend line. The future trend line might be an extension of a historical long-run trend line. The rapidity of convergence is governed by a parameter. This new method is also useful when judgment is used to adjust the forecast of a statistical model based on information not contained in the historical data. In this situation, the exponential smoothing forecast converges to a judgment-imposed future trend line that might represent, for example, a 10% increase over the exponential smoothing projected trend. Examples are given. The accuracy of this new method is compared to that of existing methods for forecasting series with long-run trends taken from the M3-competition.

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A Re-examination of Information Criteria for Model Selection in Exponential Smoothing

Anne Koehler
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Ralph Snyder
Monash University, Australia

The use of information criteria, as an aid to choosing between different forecasting methods, will be considered in this talk. The emphasis will be on their application to various standard forms of exponential smoothing. A study, which utilizes the M3 competition time series, and which compares a number of information criteria and the commonly used prediction validation approach, will be discussed. In the process, the need to consider the innovations state space models underpinning exponential smoothing to properly account for prediction risk, will be highlighted; the maximum likelihood approach to estimating the smoothing parameters will be sketched; and issues surrounding the treatment of seed states for the associated recurrence relationships will be addressed. In addition, insights will be provided as to why information criteria are never used to choose between ARIMA models with different numbers of unit roots (different degrees of differencing).

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FM18
Contributed Session: Model Specification II

Tuesday 2:15pm-3:15pm Room: Herald

Chair: Yeasmin Khandakar
Monash University, Australia

How small is large enough? Assessing the informational assumptions in applied macroeconomic modelling

Marta Banbura, Domenico Giannone, Lucrezia Reichlin
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One of the main sources of model miss-specification in econometric models for macroeconomics and forecasting is the assumption on the conditioning information set, i.e. on the relevant variables to include in the regression. The typical structural macro model includes a handful of key variables and the most common monetary VAR ranges from three to about ten variables. Although the justification for working with small models is that the focus of the analysis is often on a small set of macroeconomic variables, there is no reason to believe that agents or policy institutions do not use larger datasets for extracting information and forecasting. If this feature is not taken into account, the model will be misspecified. Not only forecasting performance might be poor, but it might be impossible to identify structural shocks. Indeed, recent literature has showed that large models help forecasting both real activity and price dynamics and this suggests that small models are possibly miss-specified. This paper asks the question of what is the size of the system we should use in applied macro modelling. To this end, we evaluate VARs under different informational assumptions: from the small system typically used in the literature up to larger systems which include more than hundred macroeconomic time series, those typically scrutinized by professional forecasters. We compare forecasting performance of models of different size, identify and estimate the monetary shock associated with each model and analyse how different informational assumptions affect these estimates. To overcome the course of dimensionality, we pursue a Bayesian approach. In particular, we adopt the concepts of Litterman's Minnesota prior. We find that Bayesian VARs are a promising framework for analysis of medium- and large- size systems producing both accurate forecasts and implying effects of unexpected monetary policy innovations that are consistent with macroeconomic theory.

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Regression Model Specification with No Theory and Complex Dependencies

Seppo Pitkanen, Tarja Sihvonen, Juha Kittia

In many cases, especially when explaining economic variables by technical ones, no guiding theory on the nature of dependencies exits. The relationships and mutual influences of the independent varaiables may also be compliated. This causes problems with multicollinearity and error term behavior. A deeper analysis of those relationships is not often possible in practice, since the production process allows no time for specific experiments. The macchinary itself must be taken as given. In the study at hand, production line costs of a printing house are predicted by 20 technical variables. The basic linear and loglinear models, as well as the mixed ones, yielded coefficients of determination less than max 0.28 in stepwisw estimation. The authors show a specification procedure, by which the degrees of determination are greater than min 0.97, and all mathematical conditions of a good regression model are met. Some useful pieces of advice for correpondung practical forecasting problems are also proposed.

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Automatic ARIMA forecasting using an Empirical Information Criterion

Yeasmin Khandakar, Rob Hyndman
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It is a difficult task to obtain an optimum Autoregressive Integrated Moving Average (ARIMA) model from the vast class of ARIMA models for forecasting a time series. We propose an automatic algorithm based on an empirical information criterion to select the best possible ARIMA model for forecasting.The Linear Empirical Information Criterion (LEIC) penalizes the maximized log likelihood by a linear function of the number of parameters in the model. In three steps, the algorithm identifies the best model from a group of tentative models. First, each series is divided into two segments: a fitting segment and a hold-out segment. All ARIMA models under consideration are estimated by MLE and the maximized log likelihood is recorded for each time series and each model using the observations from the fitting segment. The forecasts obtained from a model are compared to the observations in the hold-out segment. A tentative penalty value is obtained for each forecast horizon by minimizing a suitable out-of-sample forecast evaluation measure in the hold-out segment. The final penalty value for all series is obtained by averaging tentative penalty values across all forecast horizons and across all series. In the final step, all models are updated to include all data and the best model is chosen according to the minimum LEIC. We show that the algorithm works well if a large number of similar series need to be forecast. The algorithm is applicable to both nonseasonal and seasonal time series. We apply this algorithm to the M3-competition data and the data from the transportation competition.

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NN3
Invited Session: NN3 Competition III

Tuesday 2:15pm-3:15pm Room: Hudson

Chair: Sven Crone
Lancaster University, UK

NN3 Forecasting Competition: Forecasting time series data using Feed Forward Neural Networks

Chipo Mlambo
University of Stellenbosch, South Africa

This paper documents the methodology used in forecasting 111 time series of the NN3 forecasting competition. It details the preparation of the data, the design of the network architecture used, the network training strategy adopted and the criteria used for the early stopping of network training. All the decisions that need to be made to ensure an optimally trained network and how the forecasting is implemented in SAS Enterprise miner version 9.1.3 are detailed. The paper adopts the method of preprocessing the data to speed up the network's learning process. This includes smoothing the data to remove noise using the moving average method. Where data is nonstationary, first differencing is also applied to make the data stationary. Autocorrelation and partial autocorrelation functions are used in identifying the lagged variables used as input nodes. Lags corresponding to partial autocorrelation coefficients that are significantly different from zero are selected. The process is similar to the identification step in the Box-Jenkins methodology. The Baum-Hassler rule and the Akaike Information Criterion are used to determine the number of hidden nodes. This is meant to ensure that the networks generalise rather than memorise the patterns. The feed forward neural network architecture and the sigmoid activation function are used in this forecasting competition due to their widespread applications in the literature.

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Combining the Theta Model with Artificial Intelligence

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Konstantinos Nikolopoulos, Vassilios Assimakopoulos
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This paper presents the integration of Artificial Intelligence mechanisms in the Theta model, a univariate forecasting method originated in 1999, based on the concept of modifying the local curvature of the time-series. The resulting series, the "Theta-lines" maintain the mean and the slope of the original series but not their curvatures. Their primary qualitative characteristic is the improvement of the approximation of the long-term behaviour of the data or the augmentation of the short-term features. Theta model decomposes the original time series into two or more different Theta-lines. These are extrapolated separately usually with Exponential Smoothing methods and the subsequent forecasts are combined with equal or optimal weights. This paper presents the results of the use of Artificial Intelligence in: a) Extrapolation of the Theta lines, b) Selection of the Theta lines, c) determining the weights of the combinations of the Theta lines. The new approach will from now on called, ThetaAI. Simulations in a subset of the M3 competition (the NN3 dataset) show promising results, however the computational intensity of the approach is not to be overlooked.

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Results of the NN3 Neural Network Forecasting Competition

Sven Crone
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Konstantinos Nikolopoulos
The University of Manchester, UK

Despite over 20 years of research and more than 5000 publications on artificial Neural Networks (NN) for forecasting across various disciplines, NN have not demonstrated valid and reliable performance in forecasting competitions on empirical time series. In 2007 we conduct an empirical evaluation of NN and other methods of computational intelligence through the NN3 competition. The competition aims to resolve two research questions: (a) What is the performance of NN in comparison to established forecasting methods? (b) What are the current ‘‘best practice’’ methodologies utilised by researchers to model NN for time series forecasting. The NN3 competition evaluates the ex ante accuracy of forecasting the next 18 observations on two homogeneous sets of 111 or 11 time series of varying length and time series patterns on multiple established error metrics. We present the results of the ISF07 submissions to NN3 in comparison to established statistical benchmarks and evaluate the contribution of NN3 to current research and the set research questions.

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TS9
Invited Session: Real-Time Data 2

Tuesday 2:15pm-3:15pm Room: Olmstead

Chair: Michael W. McCracken
Federal Reserve Board of Governors, USA

What Can We Learn from Comprehemsive Data Revisions for Forecasting Inflation? Some U.S. Evidence

Pierre Siklos
Wilfrid Laurier University, Canada

The empirical properties of benchmark revisions to key U.S. macroeconomic aggregates are examined. News versus noise impact of revisions is interpreted via the cointegration property of successive benchmark revisions. Cointegration breaks down in the last two years before a benchmark revision. To demonstrate this feature we employ recently proposed cointegration breakdown tests proposed by Andrews and Kim. Hence, we conclude that there is some information content in benchmark revisions. This last point is illustrated by reporting that inflation forecasts could be improved by the addition of a time series that reflects benchmark revisions to real GDP. Standard backward and forward-looking Phillips curves are used to explore the statistical significance of benchmark revisions. In the case of forward looking Phillips curves we also demonstrate the importance of testing for instrument weakness and relevance.

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Incorporating Vintage Differences and Forecasts into Markov Switching Models

Jeremy Nalewaik
Board of Governors of the Federal Reserve, USA

This paper discusses extensions of standard Markov switching models that allow estimated probabilities to reflect parameter breaks at or close to the end of the sample, too close for standard maximum likelihood techniques to produce precise parameter estimates. The basic technique is a supplementary estimation procedure, bringing additional information to bear to estimate the statistical properties of the end-of-sample observations that behave differently from the rest. Empirical results using real-time data show that these techniques improve the ability of a Markov switching model based on GDP and GDI to recognize the start of the 2001 recession.

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Tests of equal predictive ability with real-time data

Michael W. McCracken
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In this paper we provide analytical, Monte Carlo and empirical evidence on tests of equal out-of-sample predictive ability for pairwise model comparisons estimated using real-time data allowing for possible changes in the covariance structure across vintages. We consider comparisons whereby the models are non-nested as well as nested. In both cases we restrict attention to linear models estimated and evaluated using quadratic loss. We find that accounting for the changing vintages of data can imply serious changes in the asymptotic distributions of the test statistics. These changes depend critically upon whether or not data revisions are driven exclusively by a "news" framework or whether the revisions also consist of "noise". In a pure ‘‘news’’framework our asymptotics (essentially) collapse to those in West (1996) Clark and McCracken (2001, 2005). When some ‘‘noise’’ is present, we find that the existing results are overturned: parameter estimation error matters for non-nested models even though the same loss function is used for estimation and evaluation and the standard Diebold-Mariano style t-test diverges under the null of equal predictive ability for nested comparisons. With these new results we show how to construct tests of equal predictive ability that are asymptotically normal in the presence of noisy revisions. We illustrate the importance of taking account of real time data revisions in forecast inference with an application to real time forecasts of inflation from common, simple univariate and multivariate models of inflation.

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TS10
Contributed Session: Seasonality III

Tuesday 2:15pm-3:15pm Room: Duffy

Chair: Mark Frost
Carreker Corporation, USA

A Structural Forecast for Service Provider Industry Revenue

Tom Au, Kang Shen, Subbarao Narayana, Quang-Qin Ma
AT&T Labs, USA

Service provider industry, such as telecommunication, finance and cable service, conducts service revenue forecasts regularly for corporate planning and monitoring purposes. Service revenue forecasting is an estimate or prediction of future customer service revenue based on customers historical service information. It is an important tool for business management to anticipate market trends and prepare business for either to benefit from or to counteract them. However, a business decision will be very difficult to make when a forecast is only about the trend and seasonal changes, since it hard for decision makers to identify actionable items. Given any companies, the customer activities components can be built into a forecast, which called structural forecast, so the decision maker would be able to capture the key drives though the customer activities. The ideal situation would be a forecasting model incorporates lots of business meaningful attrition variables that people can act upon according to the importance of those variables. Since all ideal driver variables are business / industry/ service specific, so it is not our focus here. This talk proposes a framework of a structural decomposition and forecast that is common to service provider industry. In particular, we consider a basic decomposition of three major components: Adds (new), Disconnects (churn) and Base. We define these three components by using a time window of k-month. The monthly revenue is the function of add revenue, disconnect revenue, base revenue, and error vector, which could be affected by customers/accounts come in and go out within the window. In this study we explore the relationships of the above structural frames when time move forward, and proposed forecasting techniques to project the frame forward. Finally, we use k=2 as an example to demonstrate the results.

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Short-term public finance indicators for fiscal surveillance in Europe

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Short-term fiscal indicators based on public accounts data have been scarcely used in the field of fiscal forecasting in Europe. Their use tends to be controversial in the policy arena given concerns about coverage (usually referred to central government) and statistical definitions (cash-basis versus accrual principle in national accounts). Nevertheless, some recent literature suggests the validity of public accounts data to forecast government deficits in the euro area. We progress on this literature in two fronts: (i) we use a wide, disaggregated set of cash indicators to assess their relevance for general government forecasting (up to 40 revenue and expenditure items), (ii) we use a mixed-frequency state-space model to integrate readily available monthly cash data with annual general government series. By doing so, we are able to maintain the focus on forecasting and monitoring annual outcomes, while making use of infra-annual fiscal information, available within the current year. The paper makes a strong point for the use of monthly cash indicators for multilateral fiscal surveillance at the European level.

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Automatic Forecasting of Cash as a Good: Lessons from the ATM Business

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Economists often argue cash is just a another good. On the retail side certainly, cash to an operations banker is indeed an inventoried good exposed to the same benefit-cost decision values as other consumables. Nevertheless, cash is a special good for its stocks circulate as the medium of exchange and its warehouses are financial intermediaries. The unique inter-dynamics of supply (deposits) and demand (withdrawals) create special forecasting challenges that require a creative deployment of forecasting heuristics that can adapt and react on a utilitarian enterprise value proposition. This paper explores the global economic nature of retail and wholesale cash banking from a forecasting and inventory management perspective. Vault, Branch, and ATM cash data is very dirty, volatile, non-stationary, and takes just about every form imaginable with seasonal obfuscation nearly always a serious problem. After a review of best and worst practices, data issues, and the mitigation processes thereof, we will chronicle and explain the various methodologies and heuristics employed within the automatic forecasting of such concerns. Lastly, we outline the challenges for future research and development given expected market dynamics as well as institutional changes such as the new cross-shipping policies of the US. Federal Reserve. The reader/listener should finish with a keen understanding of the economics of bank cash management, the importance and limitations of cash forecasting, and an epistemological challenge towards future research of the answering of current known unknowns.

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EC5
Contributed Session: Asymmetries

Tuesday 3:30-5:00pm Room: Gramercy

Chair: Ben Vogelvang
Vrije University, The Netherlands

Forecasting using asymmetric loss functions

Veni Arakelian
University of Cyprus, Cyprus

Veni Elias Tzavalis
Athens University of Economics and Business, Greece

The notion of asymmetry is very popular in economics and have been studied in terms of various problems. Batchelor and Peel (1998) and Elliott, Komnujer and Timmermann (2004) proposed new methods for testing forecast rationality jointly with flexible families of loss functions, to cure the usual rejection of this joint hypothesis by the empirical literature. The efficient formulation of expectations is of particular interest in macroeconomics, where the forecaster uses all the available information combined with the assumption of rationality. The last is widely tested using quadratic loss due to its simplicity. Abandoning the symmetric loss, rationality no longer requires that the forecast errors are unbiased as shown by Zellner (1986) or Christoffersen and Diebold (1997). Chistoffersen and Diebold (1997), Diebold (2001), and Granger and Pesaran (2000) call for a more decision theoretic approach to forecasting that considers the losses derived from over-and-under predictions. One such commonly suggested loss function is the LINEX loss function (Varian (1974),Zellner (1986)). In this paper we propose an ADL to serve as forecasting model allowing for asymmetries in the loss function. LINEX is used and is compared with the quadratic loss, where the last is prevailing in econometrics due to its convenience and tractability. The existing literature uses classical methods of estimation, facing limitation, e.g., negative probabilities in the Cornish-Fisher expansions. Thus, we employ the Bayesian inference to estimate it. In our case, the Bayesian estimation becomes feasible due to an adoption of an MCMC algorithm together with a Laplace approximation due to the complexity of the optimal forecast derived from the LINEX loss.The presence of a dynamic term in the model, enable us to insight how the Mean Square Forecasting Error changes and its effect combined with the various magnitudes of the parameter of the asymmetric loss function. We apply our methodology to derive optimal forecasts of the interest rates and test the market efficiency hypothesis under risk aversion.

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On the Estimation of Loss Function Parameters using Density Forecasts

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We consider three alternative ways to conduct rationality tests under asymmetric loss functions and to estimate the loss function parameters: the GMM method that utilizes only point forecasts and not any information from the density forecasts; the unbiasedness regression augmented by forecast variance 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 GMM method attributes more forecast bias to asymmetric loss function and less to forecast irrationality. The other two methods, however, attribute more forecast bias to forecast irrationality and less to asymmetric loss function. In addition, we find that the use of information from the density forecasts produces more plausible estimates of loss function parameters. We also investigate Grangers conjecture that the loss function may depend on certain state variables and exogenous factors, and find that the loss function parameters depend on forecast horizons and the state of current macroeconomic conditions.

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Portfolio Construction with Asymmetric MGARCH Models: A Comparison of Methods

Harald Schmidbauer, Vehbi Sinan Tunalioglu
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It is well-known that the joint behaviour of stock markets and the crude oil market can be captured best by asymmetric conditional correlation models, allowing for asymmetric volatility spillovers between these markets. Our study investigates practical consequences of these facts for investors seeking a combination of stocks and commodities in their portfolios. We adopt a global minimum-variance portfolio approach, which is characterized by a minimization of risk, where we assume that no risk-free asset is available. The only input required for constructing a sequence of such portfolios is a series of updated correlation forecasts of asset returns. We use several MGARCH models, some of which are asymmetric and new, to obtain the latter. The portfolios constructed in the way outlined are rated with respect to the return they yield, using an unconditional correlation approach as benchmark. One of our findings is that returns can be increased substantially by taking asymmetry explicitly into consideration when forecasting the next time period's correlation.

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Testing and Modeling Conditional Asymmetries in Multivariate Distributions of U.S. Equity Returns

Emre Yoldas
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Recent research shows that when the returns of the U.S. aggregate market portfolio and an equity portfolio are negative (and especially large in absolute value), the correlation between them is greater in magnitude. Motivated by this stylized fact, this paper focuses on assessing the statistical and economic significance of this type of asymmetries in a time series framework. It is shown that similar asymmetries are present when the conditioning is done with respect to lagged returns. The multivariate threshold modeling methodology of Tsay (1998) is used where weighted averages of lagged returns are utilized as threshold variables. Moreover, monthly realized volatility measures based on daily data are also considered as threshold variables to analyze the impact of changing volatility on correlation magnitudes. The predictive ability of the proposed models is compared with a benchmark linear VAR using Whites reality-check. Finally, economic significance of this modeling strategy is assessed by considering the portfolio allocation problem of a mean-variance investor.

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BC13
Invited Session: Business Cycles and Growth

Tuesday 3:30-5:00pm Room: Duffy

Chair: Victor Zarnowitz
The Conference Board, USA

On the Measurement and Analysis of Aggregate Economic Activity for China: the Coincident Indicators Approach

Feng Guo, Ataman Ozyildirim, Victor Zarnowitz
The Conference Board, USA

Growth and business cycles are interrelated in modern market economies, and the monitoring and understanding of both are crucial for macroeconomic analysis, forecasting, and policy. This is already true for Chinas economy which, now, after its recent rapid transformation and growth, ranks as the second largest in the work in terms of purchasing power parity. The rise of the markets for goods and services that accompanies the growing size and complexity of the Chinese economy will continue to increase the importance of growth and business cycles in Chinas future. In this paper, we review Chinas high frequency economic time series and present our principal findings (so far) on the coincident indicators. The goal is to develop composite indexes of Chinas aggregate economic activity that will help measure its current and future macroeconomic dynamics. The next step will be to develop growth cycle measures and model for China. Here the cyclical fluctuations are defined using, not levels of the series (as in business cycle analysis), but deviations from trend (using the phase-average method).

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An Econometric Framework for Analyzing GDP Forecasts of India and its Major Trading Partners

Gultekin Isiklar
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Kajal Lahiri
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Using monthly data from the Consensus Economics Service Inc. over 1995-2002, we examine the quality of real GDP growth forecasts for India. After concluding that the forecasts are not fully rational, we then measure the degree of inefficiency in the forecasts using news utilization curves'. We find that while forecasters utilize domestic information immediately, they are somewhat sluggish in incorporating foreign information in their forecasts. It takes nearly 4 months to get foreign shocks fully reflected in Indian forecast revisions. We find, in the long run, almost 30% of the variation in GDP shocks of India come from foreign countries, and the rest is explained by domestic shocks. For France and Canada this figure is close to 50%, and can be attributed to shocks from Germany and USA respectively. The degree of vulnerability to foreign shocks for Japan is similar to that of India.

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Recognition of the Joint Point of a Dynamic Series-Evidence from China

Faqi Shi
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In recent years, many foreign scholars such as Arnold Zellner applied the Bayesian approach to predict the internal joint point or external turning point of a dynamic series, while test in the context of China are relatively deficient albeit expanding. The paper first introduces how to use the criterion of Mean Squared Error of Forecasts (MSEF) to recognize the internal joint point of a general linear model. The second part puts forward a criterion of modified MSEF (MMSEF in short), which not only reduces the calculation load greatly, but also makes recognition more convenient. Next, I put forward both the criterion of Mean Absolute Deviation of Forecasts (MADF) and the criterion of modified MADF (MMADF in short), and derive the distribution density of MMADF, and apply it to find out the internal joint point of a real dynamic series.

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Constructing Macro-econometric Model for China

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This paper creates a macro-econometric model for Project LINK of UN and presents some empirical results for China. The model is demand-side based on Keynes theory, consisting of 50 equations, of which 35 equation are stochastic and 15 identities. The model includes 7 blocks, namely production block, labor force block, income block, consumption block, investment and capital stock block, international trade block and price block. The data used in the paper are annual data from 1978 to 2005. We also divided international trade into processing trade and general trade. The processing trade is highly correlative with the foreign direct investment and world economy, but the general trade is correlative with effective real exchange rate and satisfies Marshall-Leaner condition. Through policy simulations, the results also indicate that:

1.The effect of interest rate change to economy is very small, the function of monetary policy is not through interest rate, but through loan or money supply.

2.The change of exchange rate could adjust the trade balance, the elasticity of export for general trade is about 0.58 and the elasticity of import for general trade is about 0.56.

3.Due to the crowding out effect of government expenditure, the multiple of government expenditure is 1.4 and that of foreign direct investment is 1.6.

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EC6
Invited Session: Data Revision and Model Specification Tests

Tuesday 3:30-5:00pm Room: Herald

Chair: Tucker McElroy
U.S. Census Bureau

Density Forecasting for Canadian GDP and the Role of Data Revisions

Frederick Demers
Bank of Canada

This paper looks at density predictions of Canadian GDP growth. Density forecasts of linear and non-linear time-series models are compared using different approaches and metrics. The use of real-time data is analyzed to assess the impact of data revisions on uncertainty assessment. The results show that non-linear models provide better uncertainty estimates than linear models. Interestingly, revised data tend overstate forecast uncertainty.

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Real-time filter constraints and tests: A generalization of unit-roots

Simone Elmer
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Marc Wildi
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Although unit roots are properties of the data generating process (DGP) that affect its long term dynamics, they are generally inferred from short-term statistics based on one-step ahead forecasting performances. This methodological discrepancy may lead to model mis-specification that affects multi-step ahead performances of the model. As a consequence, real-time signal estimates can be more or less severly affected. Testing for filter constraints (instead of properties of the DGP) enables to focus on the relevant estimation problem by accounting for one- as well as multi-step ahead performances simultaneously. It is shown that the proposed new test can be interpreted as a generalization of traditional unit root tests by specifying a corresponding very simple signal extraction problem.

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Modeling Data Revisions: Measurement Error and Dynamics of True Values

Jan P.A.M. Jacobs
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Simon van Norden
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This paper provides a new framework with which to model data revisions. Policy makers must base their decisions on preliminary and partially revised data of varying reliability. Realistic modeling of data revisions therefore can play an important role in policy formulation. A common way to model data revisions is to set up a state-space model with separate blocks for measurement errors and the dynamics of ''true'' values. However, empirical work suggests that measurement errors typically have much more complex dynamics than such models allow. This paper describes a state-space model that allows for richer dynamics in these measurement errors, including the noise, news and spillover effects documented in this literature. We also show how to relax the common assumption that ''true'' values are observed after a few revisions. The result is a unified and flexible framework that allows for more realism in the model of data revision and also allows analysis of optimal real-time estimation of trends and cycles in real time. We illustrate the application of this framework with an analysis of a real time data sets on U.S. real output.

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Signal Extraction Revision Variances as a Goodness-of-Fit Measure

Tucker McElroy
U.S. Census Bureau

Marc Wildi
Zurich University of Applied Sciences, Switzerland

We consider the topic of model misspecification with respect to unit roots. Although unit root misspecification may indeed be fairly common, the problem is difficult to appraise due to the inappropriateness of one-step ahead forecasting error methods. We propose an empirical revision variance measure for a model-based signal extraction estimate as a measure of model misspecification, based on the idea that high revision leads correspond to an implicit multi-step ahead forecasting error criterion. A hypothesis testing paradigm for the empirical revision measure is developed through theoretical calculations of the asymptotic distribution under the Null, and the method is assessed through real data studies as well as simulations.

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H4
Invited Session: Experiment in Edidemiological Forecasting

Tuesday 3:30-5:00pm Room: Hudson

Chair: Robert A. Yaffee
New York University, USA

Opening Remarks: James N. Mills
Centers for Disease Control, USA

An experiment in Epidemiological Forecasting- Predicting trappings of rodent host populations of the Montana Deer Mouse with artificial Neural Networks

Sven Crone
Lancaster University, UK

In 1993 in the Southwestern United States, an outbreak of a frequently fatal respiratory disease HPS caused by a newly discovered 'Sin Nombre' hantavirus occurred. The virus is carried by murid rodents and Peromyscus maniculatus (the deer mouse) in the USA. There is no known cure. We present a feed-forward artificial neural network approach to forecast the monthly size of rodent host populations of the deer mouse in permanent trapping arrays in Montana. The approach evaluates multiple architectures for time series and dynamic regression approaches of predicting the deer mouse population using available local weather and explanatory variables to encode regime shifts, outliers, and end-effects. The results show promising results of accuracy in the light of the limited information on the predator populations, the rate of predation upon the prey and resulting population dynamics.

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What we learned from the CDC data

David P. Reilly
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The data was analyzed using both a Univariate and a Causal approach. In the Univariate case classic ARIMA models were identified and augmented with Pulse, Level Shift and Seasonal Pulse Variables where necessary. In the Causal case pre-whitening was used to identify the initial form of the models and classic diagnostic checking was used to augment these initial models with appropriate input lag structure and any ARIMA or Intervention Variables that suggested significance.

Tests of constancy of parameters suggested significant changes over time yielding reduced data which was then appropriately modeled. The Local Time Trend that started at 2001/8 some 16 periods before the first forecast origin 2002/11 was ''a worst case scenario'' designed to yield not only bad models but worse forecasts. The scene in the Monty Python scene where the King is trying to select a new advisor comes to mind where he pushes them over a cliff to see if they can fly. Forecasts for this series come to mind with the expected conclusion that nobody can fly or forecast worth a darn.

Causal models requiring predictions of the inputs were no panacea as the impact of some of the input series were quite significant and thus forecasts for the inputs became ultra-important as it whipsawed the forecasts. It was interesting, at least to this author, that one of the inputs (sumCdd) kept reoccurring as statistically significant at a lag of 2.

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Applying the Theta Model to Epidemiological data: CDC Long-Term Study of Hantavirus Reservoir Populations in US

Robert A. Yaffee
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Konstantinos Nikolopoulos
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Nikolaos Bougioukos
National Technical University of Athens, Greece

Vassilios Assimakopoulos
Ministry of Economy and Finance, Greece

In 1993 in United States, an outbreak of a frequently fatal respiratory disease the Hantavirus brought into the attention of the United States Centers for Disease Control and Prevention (CDC). The importance (due to the epidemiological implications for public health) and difficulty of the series (structural breaks, no seasonality, non stationarity, changes in recent trend), necessitated an as accurate as possible forecasting technique as to be employed so as to assess the longitudinal epidemiological risk of Hantavirus in United States. A mini forecasting 'blind' competition was set up where in a rolling hidden holdout of twelve consequent terms (36 months), three versions of the Theta model were compared: a) the basic version of the model with two equal weighted Theta lines L(0) and L(2), b) Theta lines L(0) and L(2) with empirically estimated optimal weights, c) a generalised version of the model where the basic version is blended at a percentage of 20% with L(-1), L(1) and L(3). Further optimisations were investigated once the hidden data were revealed. The results over a period of twelve sets of three steps ahead monthly forecasts, suggest the Theta model could be used for the efficient projection of this critical time series.

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Epidemiological Forecasting: Comparing the Forecast Accuracies of Different Forecasting Methods on a Difficult Time Series

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Sven Crone
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Konstantinos Nikolopoulos
Manchester Business School, UK

David Reilly
Automatic Forecasting Systems, USA

Kent Wagoner
Ithaca College, USA

James N. Mills, Brian Amman
Centers for Disease Control, USA

Rick Douglass
Montana Tech, USA

In 1993 in the Southwestern United States, an outbreak of a frequently fatal respiratory disease occurred. The United States Centers for Disease Control and Prevention (CDC) was called in to investigate. Early symptoms included fever, headaches, muscle aches, stomach problems, dizziness and chills. Later symptoms were coughing, shortness of breath, pectoral tightness, pulmonary edema and death in about 50% of cases. This disease, found to be caused by a newly discovered hantavirus, was called hantavirus pulmonary syndrome (HPS). Hantaviruses are carried by murid rodents throughout the world. The most important hantavirus in the United States is the Sin Nombre virus, carried by Peromyscus maniculatus (the deer mouse). HPS is contracted from inhalation of aerosolized virus from infected mouse urine, saliva, or nesting materials. There is no known cure. To assess the longitudinal epidemiological risk of HPS, the CDC, in collaboration with several partners, including Montana Tech University, began trapping mice in the United States. To develop a model to forecast the size of rodent host populations, time series were from the monthly abundance of deer mice on permanent trapping arrays. The findings represent the endeavor to develop and evaluate a deer mouse population size forecasting model in the Northwestern United States from available local weather data. The resulting series contained numerous problems for forecasterssuch as regime shifts, outliers, and end-effects. A forecasting tournament of this difficult series was organized. Using a rolling origin forecasts, Robert Yaffee compares the forecasts of 14 different methods for forecast accuracy. These methods include transfer function models, feedforward artificial neural networks, state space models, the original Theta method, a new generalized Theta method presented, and variety of exponential smoothing methods. This session presents the forecasts and assesses the comparative forecasting accuracy of these methods.

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F9
Contributed Session: Financial Modeling

Tuesday 3:30-5:00pm Room: Gotham

Chair: Akram M. Chaudhry
University of Bahrain

Modeling Financial Data via Levy Flight Approximations of Scaled Random Walks

Chang C.Y. Dorea, C.E. Guevara Otiniano
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Complex systems under anomalous diffusive regime can be modelled by approximating sequences of random walks, where the random variables have fat-tailed distributions. Such random walks are referred by physicists as Levy flights or motions and have been used to model financial data.In this work, instead of modelling the data by Levy motions, we assume that a scaled transformation of the corresponding random walk possesses a limiting Levy stable law. We present consistent estimates for the stability index and for the scaling parameter of the limiting law. Variations of the model that allow distinct left and right tail behavior will be explored and numerical illustrations applied to foreign exchange rates will also be included.

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A statistical model for forecasting a firm's expenditure

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IBM T.J. Watson Research Center, USA

Bibhas Chakraborty
University of Michigan, USA

We present a statistical model of the expenditure over time of a firm or other business organization.

We use the following model of expenditure. At the start of the financial year a budget is set. The budgeted amount is made available ("released") in stages through the year. Expenditure arises from "projects", which can "commit" expenditures by issuing purchase orders for goods or services from outside suppliers. Each purchase order results in one or more payments being made to the supplier (often following the receipt of an invoice from the supplier): it is these payment events that cause expenditure to be recognized in the firm's accounts.

We model the expenditure that arises from a single commit as a marked point process with parameters that vary across the commits, and are estimated from historical data using attributes of each commit and the projects that gave rise to them. We also model the dates and amounts of future commits, using regression to model the rate of amount committed as a function of the amount ''available to commit'' (cumulative year-to-date amount released minus cumulative year-to-date amount committed) and the time of year. With these models and a schedule of future releases, we can construct forecasts of future expenditure over some time horizon, typically from the current date until the end of the financial year. The forecasts can be used by the firm's controller or other financial officers to assess whether the budget is likely to be exceeded and to plan future releases. The statistical methods are illustrated with examples of modeling the capital expenditure of an IBM business unit.

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Thick modelling: Combining trading signals from technical trading rules and econometric models

Nikolaos Nitsas
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Financial research has shown that a number of macroeconomic and financial variables can successfully predict stock returns. On the other hand, academic studies have provided evidence that simple technical trading rules could also generate profitable trading opportunities. However the profitability of both of these methods seems to weaken considerably when more recent samples are taken into account. The purpose of this paper is to examine whether it is feasible to combine the two approaches (time-series predictability and technical indicators), and arrive at trading strategies that produce superior risk adjusted returns. We propose a novel methodology to combine trading signals for the US stock market from 184 different models in total. Our combination strategy is based on the accumulated wealth from each model and the proportion of times the sign of realised excess returns is forecasted correctly. Overall, our results show that our approach can enhance the predictability and profitability of stand-alone models.

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Dynamic Modeling and Forecasting of Financial Time Series Polluted with Colored Noise Processes

Akram M. Chaudhry
University of Bahrain

In almost all spheres of finanicial life significant time varying changes in prices of commodities, stocks and currencies are observed. These changes, quite often attributed to ARMA(p,q) type colored noise processes, are neither easy to identify nor accommodate in to the strutures of dynamic models. For this purpose, a family of linear dynamic system and state space models is presented and their parameterization discussed. To select a suitable model from a set of candidate models for anlysis of typical finacial data a model identification procedure based on ATS: Akram Test Statistic is considered. To examine practical implications of the models, data on currency exchange rates are analyzed and short to long term forecasts generated.

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EC7
Contributed Session: Learning and Disagreement

Tuesday 3:30-5:00pm Room: Soho

Chair: Bruno Deschamps
University of Bath, UK

Does the Adoption of Rolling Forecasts Improve Planning?

Lloyd Tanlu
Harvard Business School, USA

This study investigates the consequences of adopting rolling forecasts. In particular, I examine how forecast bias, accuracy, and efficiency are affected after the implementation of a rolling forecasting system. Using quarterly product-line forecasted and realized sales data from several business units of a multinational biotechnology supplier, I find that subsequent to the use of rolling forecasts, forecast errors (defined as the scaled difference between actual and forecasted results) are more negative, suggesting the mitigation of sandbagging behaviors in setting forecasts. This effect is stronger in regions where there is greater information asymmetry. However, the result forecasts errors have become significantly negative suggest that forecasts may have become overly optimistic. Furthermore, contrary to claims by practitioners and popular press, forecast accuracy actually worsens, particularly in regions exhibiting greater demand uncertainty, after rolling forecasts are put in place, suggesting that forecasters incorporate irrelevant information into their forecasts.

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Uncertainty and Disagreement in Economic Forecasting

Stefania D'Amico, Athanasios Orphanides
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Using the probabilistic responses from the Survey of Professional Forecasters, we study the evolution of uncertainty and disagreement associated with inflation forecasts in the United States since 1968. We compare and contrast alternative measures summarizing the distributions of mean forecasts and forecast uncertainty across individuals at an approximate one-year-ahead horizon. In light of the heterogeneity in individual uncertainty reflected in the survey responses, we provide quarterly estimates for both average uncertainty and disagreement regarding uncertainty. We propose direct estimation of parametric distributions characterizing the uncertainty across individuals in a manner that mitigates errors associated with rounding and approximation of responses when individual uncertainty is small. Our results indicate that higher average expected inflation is associated with both higher average inflation uncertainty and greater disagreement about the inflation outloo k. Disagreement about the mean forecast, however, may be a weak proxy for forecast uncertainty. We also examine the relationship of these measures with the term premia embedded in the term-structure of interest rates.

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Learning and Disagreement in Macroeconomic Forecasts

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We develop a simple model of professional forecasters' behavior with Bayesian learning that explains the evolution of forecast disagreement over forecast horizons. Forecast disagreement is posited to have three components due to differences in: i) the initial prior beliefs, ii) the weights attached to updated priors, and iii) the interpretation of the public signal. Using monthly GDP forecasts of G7 countries during 1990-2004, our panel data estimates show that the importance of the first component steadily declines over horizons, the second component has barely any effect on the evolution of forecast disagreement, and the third component depends on the timing and quality of new information. At longer horizons, forecasters interpret new information differently because of low perceived quality, and thus forecast disagreement stays high. At shorter horizons, news about GDP is more precise and hence forecasters give them more weights and interpret them similarly, leading to low disagreement. Our analysis of forecast revisions shows that it is the within variation in the data, not the between variation, that dominates forecasters' behavior.

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Strategic Forecasting among Experts

Bruno Deschamps
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We analyze the forecasting behavior of experts. Contrary to the literature, we do not assume that all events are equally easy or difficult to forecast. We find that careerist experts bias their forecasts in direction of the events which are relatively easy to forecast for good experts and difficult to forecast for bad experts. As a result, experts may choose to release forecasts that excessively contradict public information (anti-herding). We also find that the nature of their behavior crucially depends on their reputation level and the verifiability of their forecasts. We finally predict that young analysts release less conservative forecasts.

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BC14
Contributed Session: GDP II

Tuesday 3:30-5:00pm Room: Chelsea

Chair: Thomas Trimbur
Federal Reserve Board, USA

Forecasting Spanish GDP

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Roman Minguez, Agustin Garci
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The objective of this paper is to forecast the Spanish GDP using both perspectives: demand and supply components. To compare the different alternatives we use univariate models, transfer models with leading hard and soft indicators, previously selected using the PC-GETS algorithm, and uniequational models with correction error mechanisms. To assess the performance of all the possibilities, including different models with different levels of aggregation, we have used as in-sample measures of fitness as out-of-sample forecasts errors for different horizons.

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A euro area estimate of monthly GDP

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Cecilia Frale, Tommaso Proietti
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Massimiliano Marcellino
Universita Bocconi, Italy

A real-time monitoring of the economic activity requires timely and reliable information on the whole economy. Main requirements of such exercise are a clear representation of the macro-economic cyclical behaviour and the possibility of performing reliable short-term forecasting and econometric modelling. In the past years most short-term investigations relied on the industrial production index or on some of its proxies. Nowadays it is widely recognized that also non-industrial activities are characterized by economic fluctuations, so that an accurate short-term macro-economic analysis has to take them into account. In this respect GDP seems to represent the most appropriate indicator for short-term business cycle analysis and forecasting. Unfortunately GDP is only available on quarterly basis with a few exceptions (i.e. UK), which is considered a too low frequency from the analysts point of view. For those reasons, an increasing interest of institutional and non-institutional users on the availability of a monthly estimate of GDP is considerably rising. This paper describes an innovative multivariate approach, fully consistent with National Accounts constraints allowing the derivation of a statistically robust estimate of the euro area GDP on a monthly basis. Output side and expenditure components of GDP are dynamically estimated by means of parametric dynamic factor models in a state-space framework. The multivariate models are cast in the state space form and computational efficiency is achieved by implementing univariate filtering and smoothing procedures. The final estimate of the euro area GDP is then obtained by combining the two estimates with optimal weights, reflecting their relative precision. Results of an extensive simulation study are also presented to show the performance of this approach and the dynamic properties of the monthly estimates of the euro area GDP. Moreover, the model forecasting accuracy as well as its ability to timely detect turning points were investigated.

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Nowcasting an Economic Aggregate with Disaggregate Dynamic Factors: An Application to Portuguese GDP

Antonio Jose Morgado, Luis Catela Nunes, Susana Salvado
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Reliable estimates of the current state of the economy in the form of GDP growth rates are essential for policy purposes. However, typically, quarterly GDP figures are only published several weeks after the end of each quarter. But since several short-term economic indicators are always available a few days after the end of each quarter and well before the release of the first GDP figures, a preliminary estimate of quarterly GDP growth could be computed from the movements in these indicators. Factor models are a well-known approach to summarize the information coming from a large number of variables into a small number of factors that are linear combinations of all the variables in the dataset. This paper explores how dynamic factor models can be used to forecast aggregate GDP by aggregating forecasts of its expenditure disaggregates in the context of an empirical study. It is important to notice that the variables we want to forecast are quarterly, while the majority of the short-term indicators are monthly. Moreover, the series are released with different delays and available for different historical periods. This creates two problems that we address in this study: (i) the use of an unbalanced monthly dataset when extracting the common factors covering the largest possible time span, and (ii) forecasting the quarterly variables using the information from the monthly common factors. We compare the out-of-sample forecasting performance of dynamic factor models used to forecast aggregate GDP directly with the alternative approach of aggregating the forecasts obtained from specific dynamic factor models for each major expenditure disaggregate. The results obtained suggest that there is no advantage in aggregating the forecasts obtained using specific dynamic factor models for each of the major expenditure disaggregates.

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The dynamics of oil price movements and their relationship with real GDP

Thomas Trimbur
Federal Reserve Board, USA

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A time series model with heavy-tailed disturbances is used to analyze oil price movements and their relationship with the business cycle. The model has the form of a generalized local linear trend with stochastic cycle. The aim is to capture outliers and level shifts as empirical regularities in oil price dynamics and to make a connection with the cycle in real GDP. The model also includes the possibility of shifts in direction. By predicting a positive probability of outliers and shifts in trend in advance, the model can give useful forecasts for series with breaks. In estimating the impact of recent events, there is a continuous range of outcomes, and this information is updated optimally each period.

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H5
Contributed Session: Healthcare Forecasting

Tuesday 3:30-5:00pm Room: Empire

Chair: Christie L. Teigland
NYAHSA, USA

The Utility of Health Care Preference Measures in Predicting Future Health Care Expenditures

Steven Cohen
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Given the high concentration of health care expenditures in a given year among a relatively small percentage of the population, a prediction model that can accurately identify the persistence of high levels of expenditures is an important analytical tool. This type of modeling effort also enhances the ability to discern the causes of high health care expenses and the characteristics of the individuals who incur them. This feature also applies to prediction models that can accurately identify those individuals with persistently low or average levels of expenditures. Furthermore, such modeling efforts are particularly attractive to assist in the targeting of disease management programs to high cost cases, which may facilitate reductions in the concentration of overall future year health care expenditures. The national Medical Expenditure Panel Survey (MEPS), sponsored by the Agency for Healthcare Research and Quality (AHRQ), is particularly well suited for supporting modeling efforts of this nature. By collecting nationally representative information on health care utilization and expenditures experienced over a two year period, the survey informs analyses that examine the persistence of health care expenditures over this two year window. In addition to the availability of predictor information on prior health status, health care utilization and expenditure patterns and socio-demographic characteristics, the MEPS contains a series of self administered questions which discern individual attitudes regarding the need for health insurance coverage and its cost, likelihood on taking risks and perceived ability to overcome illness without medical assistance. In this paper, the performance of alternative prediction models to identify future high expenditure cases are evaluated. Par ticular attention is given to investigating the added value of the inclusion of health care preference measures in accurately predicting future health care expenditures.

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The relationship between road traffic accidents and real economic activity in Spain: Common cycles and health issues

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This paper analyses the aggregate relationships between traffic accidents and real economic activity in Spain during the last thirty years. Our general approach is based on two basic assumptions: 1) the number of accidents depends on the use of cars and other exogenous variables, and 2) the level of economic activity affects variation in the stock of cars, as well as degree of utilization. We propose a novel turning point characterization for monthly seasonal data that allows checking whether economic and road accident cycles coincide and, to date the beginning and end of their respective cycles. Empirical results from this section are important in establishing posterior causal models and whether or not economic activity and road accidents have a common component in the long run and a varying lead-lag relationship, depending on the cycles. These models will be the basis to check when Spain will achieve the European Union figures in terms of the fatalities/accidents ratio under different scenarios. Empirical results as well as historical experiences from other European countries proved that reducing fatalities is not only a question of diminishing accident rates.

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The Physician Condition

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Several significant, extreme social transformations have proceeded with a minimum of attention from anyone who is involved with or utilizes healthcare. The combination of Generation X physicians who assert different expectations about work and home-life compared to Baby Boomer physicians, and the influx of female physicians over the past three decades, has profound implications on the structure of the healthcare industry. The entire industry is now faced with different sets of expectations expressed by different generations at different times--and the disappointment felt when one generation confronts the other with expectations that may seem to have been invented for their own well-being. The resultant confusion holds far-reaching implications for practitioners, patients, public policy, and future research.

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Using Logistic Regression and Markov Chain Analysis to Better Predict Adverse Outcomes in Long Term Care

Christie L. Teigland, Zulkarnain Pulungan
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This session will report on a research study funded by the DHHS Agency for Healthcare Research and Quality (AHRQ) Patient Safety Grants Program. The goal was to determine whether preventable adverse outcomes in the frail elderly, such as falls and pressure sores, can be reduced through the use of prospective logistic regression models to better predict the likelihood of the event occurring. The models utilize linked longitudinal clinical data based on a standardized patient evaluation tool called the Minimum Data Set (MDS) that all nursing homes (NHs) must complete on admission and at least every three months thereafter as a condition of participation in Medicare and Medicaid. The models provide far more accurate risk assessments than the manually completed risk tools commonly used by nursing staffs; e.g., the models accurately predict 83 percent of the falls that occur over the next three months and more than 70 percent of pressure sores (C statistics .883; .853). ! A Markov Chain was used to model decline in functional abilities, utilizing multinomial logistic regression to construct risk adjusted transition matrices. MDS records for 1.1 million NYS NH residents for 2000-2002 were used to derive normative quarterly transition probabilities between stages of functional dependence, adjusting transition matrix for factors that affect individual patient transition probabilities. The model exhibited good fit (C statistic .882; rescaled R2 value .757). Model outcome vectors very closely replicate actual outcomes even after the passage of 10 quarterly transition intervals. As a result of this research, a risk prediction component was integrated into an Internet-based (SAS driven) quality improvement software tool used by more than 400 NHs nationwide. The models have application in a number of health policy areas including monitoring NH quality of care.

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TS11
Contributed Session: Structural Breaks

Tuesday 3:30-5:00pm Room: Olmstead

Chair: Walter Enders
University of Alabama

The Impact of Time Disaggregation in Forecasting with Structural Breaks

Jennifer L. Castle, David F. Hendry
Oxford University, UK

Structural models' inflation forecasts are often inferior to those of naive devices, and we consider potential explanations for these findings. Forecasts from equilibrium-correction mechanisms, built by automatic model selection, are compared to various robust devices. Forecast-error taxonomies for aggregated and time-disaggregated information are developed, and they reveal that the impacts of structural breaks are identical between these. Location shifts and parameter changes have the same impact regardless of whether the aggregated or disaggregated data is used and there is no clear benefit to using higher frequency data as it depends on the information losses and parameter inconsistencies deriving from time aggregation. However, the empirical evidence does provide support for moving to higher frequency data, as in a real-time context breaks can be picked up sooner. The taxonomy for the double-differenced device demonstrates that robust devices adapt rapidly to structural breaks, regardless of whether time-aggregated or disaggregated information is used. Forecast failures in structural models are driven by their deterministic terms, confirming location shifts as a pernicious cause thereof, and explaining the success of robust devices.

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Dynamic detection of change points in long time series

Nicolas Chopin
ENSAE, France

We consider the problem of detecting change points (structural changes) in long sequences of data, whether in a sequential fashion or not, and without assuming prior knowledge of the number of these change points. We reformulate this problem as the Bayesian filtering and smoothing of a non standard state space model. Towards this goal, we build a hybrid algorithm that relies on particle filtering and Markov chain Monte Carlo ideas. The approach is illustrated by a GARCH change point model.

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Forecast Adjustment and Learning

Nicholas Fawcett
Oxford University, UK

Unanticipated breaks can have severe effects on economic forecasts. This paper examines the impact of such shifts on forecasting models, focussing on three themes. First, what information is generated by a forecast model when there is a shift, and how could this be used by agents who want to learn how to improve subsequent forecasts? Secondly, even if agents know that shifts may take place, and be aware of their nature, can they use this knowledge to their advantage? And thirdly, can seeminly arbitrary transformations be used to correct forecasts immediately after the agents detect forecast failure, even though the source of this failure might be unknown? The paper discusses these problems first in a theoretical context, where the success of some atheoretic forecast models is examined, before we move on to an applied example of forecasting in a small model of the UK economy.

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Forecasting Transnational Terrorism and other Series with an Unknown Number of Structural Breaks

Walter Enders, Yu Lin
University of Alabama, USA

Ruxandra Prodan
University of Houston, USA

Economic time-series often contain an unknown number of structural breaks of unknown form. The so-called Old School (OS) forecasting methods involved differencing the data, using various types of smoothing functions, or 'intercept corrections.' The 'New School' (NS) view argues that properly estimated break dates can be used to control for regime shifts when forecasting. Nevertheless, there are still a number of issues to be resolved when using NS forecasting methods. For example, there are several variants of the well-known Bai-Perron test. Moreover, it is not clear whether to forecast with models estimated using the entire data set or using only the post-break data. In order to compare the various forecasting methods, we perform a Monte Carlo study using a large number of simulated series containing different amounts persistence and different types of breaks. Each series will be estimated using the various OS and NS methods and the in-sample and out-of-sample properties of each method will be compared. The results will then be used to suggest a method to forecast various types of transnational terrorist incidents. We will use the various OS and NS methods to forecast the number of incidents, skyjackings, and the number deaths and casualties. The transnational terrorism data is interesting because the takeover of the US embassy in Teheran and the demise of the Soviet Union have been associated with changes in the nature of transnational terrorism. Of course, the changes in the level of terrorism due to these events are likely to be gradual and there may be other unknown break dates. As such, it is of interest to compare the forecasts using these 'known' break dates to the forecasts of the various OS and NS methods.

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K4
Plenary Session

Wednesday 8:00am-9:00am Room: Astor Ballroom

Chair: P. Geoffry Allen
University of Massachusetts, USA

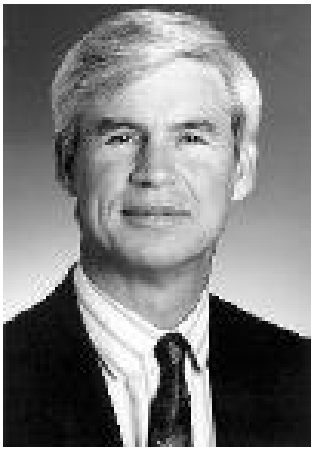
Anticipating Correlations: New Results

Robert F. Engle
New York University, USA

Correlations are central to many financial decisions. Anticipating what correlations will be is therefore an important statistical and economic problem. Correlations between asset returns change both because the line of business changes and because risk factors change over time. To build a statistical model to anticipate these changes we need models. Consider the following models

1. One factor model with constant idiosyncratic volatility
2. One factor model with garch idiosyncratic volatility
3. One factor model with garch idiosyncrasies and DCC model of the residuals

The paper considers estimation and performance of these three factor models. These models are used to construct optimal portfolios and the performance is monitored. The implications are examined for long run correlation forecasting.



Robert Engle, the Michael Armellino Professor of Finance at New York University Stern School of Business, was awarded the 2003 Nobel Prize in Economics for his research on the concept of autoregressive conditional heteroskedasticity (ARCH). He developed this method for statistical modeling of time-varying volatility and demonstrated that these techniques accurately capture the properties of many time series. Professor Engle shared the prize with Clive W. J. Granger of the University of California at San Diego.

Professor Engle is an expert in time series analysis with a longstanding interest in the analysis of financial markets. His ARCH model and its generalizations have become indispensable tools not only for researchers, but also for analysts of financial markets, who use them in asset pricing and in evaluating portfolio risk. His research has also produced such innovative statistical methods as cointegration, common features, autoregressive conditional duration (ACD), CAViaR and now dynamic conditional correlation (DCC) models.

Professor Engles interest in financial econometrics covers equities, interest rates, exchange rates and option pricing. He is currently developing methods to analyze large systems of assets, real-time volatility, market microstructure and extreme market movements. He has published more than 100 academic papers and authored four books. His articles have appeared in such publications as Econometrica, Journal of Business and Economic Statistics, Journal of Econometrics, Journal of the American Statistical Association, American Economic Review, Journal of Political Economy, Journal of Finance, Review of Financial Studies, Journal of Financial Economics.

Before joining NYU Stern in 2000, Professor Engle was Chancellor's Associates Professor and Economics Department Chair at the University of California, San Diego, and as an associate professor at the Massachusetts Institute of Technology.

He received his bachelor of science in physics from Williams College and his master of science in physics and doctor of philosophy in economics from Cornell University.

BC15

Contributed Session: Economic Indicators and Forecasting over the Business Cycle

Wednesday 9:00am-10:30am Room: Duffy

Chair: Marc Wildi
Zurich University, Switzerland

A turning point chronology for the US business cycle

Beatriz Farina
Research Seminar in Quantitative Economics (RSQE), USA

J. Luis Rojo
Universidad de Valladolid, Spain

Regarding a new concept for the business cycle showed in previous editions at ISF -the Economic Climate Cycle- the authors now apply this empirical and multidimensional approach for dating the US business cycle.

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Using a Markov Switching Framework to Analyze Signals from The Conference Board Consumer Confidence Index

Gad Levanon
The Conference Board, USA

Conference Board, is one of the most frequently cited monthly economic indicators in the United States. It was created to become an indicator of economic activity in the United States. Turning points in the index were meant to signal turning points in economic activity.

Since the seminal work of Hamilton (1989), a large body of literature has applied regime switching to various empirical settings. However, to the best of my knowledge, none of the papers that studied the usefulness of Consumer Confidence measures for forecasting economic activity and turning points used regime switching estimation. In this paper, I propose to do so.

This paper will be divided into two sections. In the first section, using a regime-switching framework, I will use autoregressive equations of the Consumer Confidence measures themselves to derive recession probabilities. I will then compare between the different series of recession probabilities derived from the different consumer confidence measures and also compare with recession probabilities derived from other economic indicators. I will also explore how the number of lags and the number of parameters that are allowed to vary across regimes influences the results. Finally, I will explore how the results are impacted when endogenous transition probabilities are introduced.

In the second section the contribution of Consumer Confidence measures will be evaluated in in-sample and out-of-sample forecasting of economic activity measures, using a regime-switching framework. I will explore whether adding consumer confidence measures to the equation improves the fit and reduces forecasting errors.

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Forecasting Output and Inflation with Financial Variables

Massimo Guidolin
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Sadayuki Ono
University of York, UK

We use a wide range of simulation experiments to investigate what properties -- e.g., frequency of the "breaks" or other sources of non-linearities, the fact that breaks influence only the conditional mean or also conditional second moments, the persistence of "regimes" defined by the occurrence of breaks, etc. -- will affect the chances of non-linear models to provide accurate predictions. We examine non-linear models of two types -- Markov switching and Smooth Threshold Autoregressions models -- both with and without explicit inclusion of financial predictors (short-term interest rates, yield spreads, default spreads, stock returns, dividend yields, etc.). Both univariate and multivariate non-linear estimation approaches are considered. We oppose non-linear models to a variety of benchmarks used in the literature, such as linear regression methods, univariate and vector-autoregressive models, exponential smoothing, and Phillips curve frameworks. We find that the out-of-sample performance of non-linear models is remarkable when the breaks define persistent, and when the breaks involve both conditional means and second moments. As an empirical exercise, we resort to 1959:01 - 2006:12 monthly data for seven OECD countries to investigate the out-of-sample performance of a large number of alternative econometric models at producing forecasts of inflation and real output growth at a variety of prediction horizons. Consistently with our simulation experiments, we find that the ability of non-linear models to produce superior predictive performance is maximum for series, countries, and sub-samples where our candidate non-linear models provide a good fit to the entire density of the data, where breaks define persistent and highly predictable regimes, and when breaks affect the correlation of the shocks to financial and macroeconomic variables. These effects are particularly strong for multivariate non-linear models. Although differentials of performance are large, the evidence in favor of non-linear frameworks is statistically significant in only one-fifth of the experiments. .

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Real-time Signal Extraction: Theoretical and Practical Issues in the Context of Leading Indicators

Marc Wildi
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Leading indicators are typical applications of real-time signal extraction techniques because a strong prospective content is associated to them. Unfortunately, traditional ARIMA-based approaches are prone to methodological limitations relying on the fact that the corresponding optimization criteria do not match the relevant (real-time) signal extraction problem. These issues are illustrated both from a theoretical as well as a practical point of view. A generalized optimization criterion is proposed which emphasizes performances of the real-time (one-sided) filter specifically towards the important turning-points. It is worth to emphasize that this selective performance of the filter is achieved without a priori knowledge about the location of turning points. From a didactical point of view, the new technique is illustrated ‘step-by-step, relying on empirical material based on the KOF-Economic-Barometer and the European-Sentiment-Indicator (ESI). Real-time filters are computed using a newly developed (public-domain) software-package written in R.

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C1
Contributed Session: Climate and Environment

Wednesday 9:00am-10:30am Room: Hudson

Chair: Jerry Wegiel
Raytheon Company, USA

Predicting the end of a drought event

Ana C. Cebrian
Universidad de Zaragoza, Spain

One of the problems of interest related to drought phenomena is the prediction of the end of a current drought event, when the only information available is the information provided by the drought process observed up to that moment. In an operative way, a drought can be defined as a run of observations of a rainfall related signal below an extreme threshold. Two approaches are considered to deal with the problem of predicting the end of those runs.

1. The length of a drought event can be seen as a survival time whose probability to fail depends , for each instant, on the state of the event up to that moment. Thus, the problem to predict the end of a drought event, conditionally to the past, can be approached by modeling the hazard function of the length variable in terms on a set of time-dependent covariates

2. The evolution of a drought event can be also expressed in terms of a binary variable associated with each observation of the run, which is equal to 1 if the observation is the last one of the event and 0 in other case. Under a Markovian dependence hypothesis, the observations of this binary variable are independent and Bernoulli distributed with a parameter which can depend on the characteristics of the event through a set of time-dependent covariates. The modeling of this binary variable can be performed in the frame of Generalized linear models with Bernoulli (Binomial) error.

The application of these methods to a Spanish rainfall series is presented.

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Near Horizon Earthquake Forecasting Using Support Vector Machines

Robert Granat
NASA, USA

We present a method for forecasting earthquakes over short time horizons based on recasting the forecasting problm as a classification problem. Motivated by the hypothesis that the stress buildup before a large earthquake is the result of particular patterns of prior earthquake activity, we use sequences of earthquakes in the seismic record as feature vectors that we can label as either preceding an earthquake (positive examples) or not preceding an earthquake (negative examples). This gives us a classical binary classification problem. Given sets of positive and negative training examples, we can build a support vector machine (SVM) model that can be used to classify the most recent sequence of earthquakes as either preceding or not preceding an earthquake. These forecasts can be tailored by placing constraints on the classifier training examples; for instance, we can limit positive labels to those examples preceding an earthquake of magnitude greater than M in the next D days within a certain geographical region.

In preliminary retrospective experiments using the Southern California earthquake catalog, we have demonstrated that this approach appears to work best on a time scale of days rather than years, with the shortest time scale tested (24 hours) yielding the best performance. Based on randomized cross-validation tests, we estimate that at this time horizon scale the method can forecast an upcoming magnitude 5 or greater earthquake in Southern California with a detection rate of 40-50% and false alarm rate under 2%. We expect that forecasts of this nature complement, rather than replace, the longer-term forecasts with superior spacial localization produced by other current methods.

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Can we improve the weather forecasts?

Emil Pelikan, Marek Brabec, Ondrej Konar
Academy of Sciences of the Czech Republic

Available and reliable meteorological data and their forecasts are very important in many areas of human activities including transportation, environmental sector, agriculture, business, sport, culture etc. In energy sector, meteorological variable forecasts (e.g. outdoor temperatures, wind velocity, cloud cover variables) form significant inputs into many energy demand forecasting models. The extreme weather conditions also have negative influence on the electricity networks reliability and stability. Usually, national meteorological offices are the official providers of meteorological data and weather forecasts in the given country. However, meteorological data and forecasts coming from the national meteorological services can be very expensive or the provider is not able to produce data in the specific form and at the specific time steps. Therefore, some research groups are focusing to investigate the properties of the regional weather prediction models which are freely provided by other research communities and which can be adapted for the given region and installed on a relatively cheap hardware. Initial data are downloadable from the internet. In this contribution we summarize our experiences with a regional weather and air pollution prediction system (called MEDARD, www.medard-online.cz), which is operationally used in the Institute of Computer Science in Prague. We discus some possibilities of utilization of the system in energy demand forecasting problem and in other fields of energy industry. The work is supported by the Grant Agency of the AS CR, grant No. 1ET400300513 and No. 1ET400300414.

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Framework for a Fully-Integrated, Risk-Based, Tactical Decision Aid for Extreme Weather Events-A Unified Baseline for Government Agencies

Jerry Wegiel
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Loren Toole, Steve Fernandez, Frank Griffith, Robert Bowne
Los Alamos National Laboratory, USA

A fully-integrated, risk-based, decision-aiding tool referred to as the Critical Infrastructure Analysis for Extreme Weather Events (CIA/EWE)-component of the Critical Infrastructure Protection/Decision Support System (CIP/DSS) was developed by the Department of Homeland Security for infrastructure protection and interdependency analysis by government (Federal, state and local) and industry decision makers. The methodology is based on a U.S. national strategy identifying and protecting 14 sectors and key resources. The goals are to develop, implement, and evolve a rational approach for prioritizing CIP strategies and resource allocations using modeling, simulation, and analyses to assess vulnerabilities, consequences, and risks; propose and evaluate protection, mitigation, response, and recovery strategies and options; and provide real-time support to decision makers during crises and emergencies. As a result, decision makers will be able to use the CIP/DSS to estimate consequences for individual sectors and assess the potential for cascading consequences across multiple sectors.

Raytheon Space Systems Omaha has teamed with Los Alamos National Laboratory (LANL) to integrate LANLs Scenario Library Visualizer (SLV), a key component of CIA/EWE, into the National Oceanic and Atmospheric Administrations (NOAA) next generation Enterprise Service Bus-based Service Oriented Architecture (SOA), the Automated Weather Interactive Processing System (AWIPS II) system. AWIPS II will be fielded at over 140 weather and river forecast offices across the United States and its territories.

The AF, NOAA, Navy, and DOT/FAA require the development, acquisition and augmentation of certain utilities and downstream applications to fully realize the utility of AWIPs. Access to a deterministic- and probabilistic- based CIA/EWE-component of the CIP/DSS capability (via the JET and AWIPS architectures) will provide the government with a unified software baseline and opportunity to do so. A technical overview and demonstration of the socio-economic effects of a notional scenario involving a Category 3 Hurricane making landfall in New York City will be presented.

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F10
Contributed Session: Financial Crises

Wednesday 9:00am-10:30am Room: Herald

Chair: Maxwell Stevenson
The University of Sydney, Australia

Financial distress predictions and the corporate governance of companies in Poland

Marek Gruszczynski
Warsaw School of Economics, Poland

Companies in Poland are examined in terms of their association with the corporate governance ratings. The study makes use of two approaches to modeling the bankruptcy, both employing the binomial logit, for the samples of 1198 and 120 unlisted companies, respectively, in 2000-2002. The models are validated for the hold-out sample of the companies listed on Warsaw Stock Exchange. The forecasts of the probability of financial failure, as well as other relevant variables, are then confronted, by means of ordered multinomial logit, with the corporate governance ratings assigned to listed companies. Two ratings are taken into account: Polish Corporate Governance Forum ratings and Polish Institute of Directors ratings. The results indicate that the forecasts of financial distress may help in positioning the companies on the corporate governance level.

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Signaling currency crises in South Africa

Tobias Knedlik
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Currency crises episodes of 1996, 1998, and 2001 are used to identify common country specific causes of currency crises in South Africa. The paper identifies crises by the use of an Exchange Market Pressure (EMP) index as introduced by Eichengreen, Rose and Wyplosz (1996). It extends the Signals Approach introduced by Kaminsky and Reinhart (1996, 1998) by developing a composite indicator in order to measure the evolution of currency crisis risk in South Africa. The analysis considers the standard suspects from international currency crises and country specifics as identified by the Myburgh Commission (2002) and current literature as potentially relevant indicators. The paper evaluates current risks for currency crises in South Africa.

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Predictive modeling in finance: building default models for subprime mortgages

Vladimir Ladyzhets
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Mortgages issued to subprime borrowers (people with low credit score) are one of the most profitable and, at the same time, riskiest assets traded on primary and secondary mortgage markets. The financial analysts are challenged to provide robust, accurate and timely estimates for defaults incurred over the life of the pools of subprime mortgages. The paper presents the case of building a library of default models that yields the multiple risk profiles of a subprime mortgage pool. It has been demonstrated that different types of decision trees, chi-square, entropy, and Gini, can be effectively used to provide the best variable selection as well as to create a multidimensional risk classification of subprime mortgage borrowers with respect of their default propensity.

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Surviving Chapter 11 Bankruptcies: Duration and Payoff?

Maxwell Stevenson, Graham Partington
The University of Sydney, Australia

In an earlier study by the authors, models were developed to jointly predict the duration of Chapter 11 bankruptcy and the payoff to shareholders. This paper augments that study using a much larger sample to re-estimate the model and assess its stability, and also provides an opportunity for out-of-sample testing of predictive accuracy. The resulting models are based on Coxs proportional hazards model and the current paper points to the need to test two important assumptions underlying the model. First, that the hazards are proportional and, second, that censoring is independent of the event studied. Using the extended data set, all the previously significant accounting variables drop out of the model and only two covariates of the original model remain significant. These are the market wide credit spread and the market capitalisation of the firm, both measured immediately prior to the firms entry to Chapter 11. Receiver operating characteristic curves are then used to assess the predictive accuracy of the original and extended models. The results show that Lachenbruch tests can provide a misleading indication of predictive ability out of sample. Using the Lachenbruch method of in-sample testing, both models show predictive power, but in a true out-of-sample test they fail dismally.

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F11
Contributed Session: Finance IV

Wednesday 9:00am-10:30am Room: Gotham

Chair: Leighton Vaughan Williams
Nottingham Trent University, UK

Forecasting Equity Returns in South Africa Using Equity Returns of Developing and Developed Countries: A Generalized Dynamic Factor Model

Alain Kabundi
RAU, University of Johannesburg, South Africa

Globalization of the world economy has added new impetus to financial integration. Recent financial crises in emerging markets have been explained as the combination of rapid surges in capital inflows and their sudden reversals due mainly to liberalization of their capital markets. This paper uses the Generalized Dynamic Factor Model (GDFM) proposed by Forni et al. (2005) on large panel of equity returns of developing and developed countries to forecast stock returns of the South African All Share Index (ALSI). Against this background, we extract the common component of ALSI return based on the Arbitrage Pricing Theory (APT), and then we use this common component to forest ALSI return. The results obtained from out-of-sample data suggest the GDFM outperforms the Random Walk Model (RWM).

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Algorithmic Trades and Order Book Forecasts

Johannes Prix, Otto Loistl, Michael Huetl
Vienna University of Economics, Austria

Computerized trading controlled by algorithms - 'Algorithmic Trading' - has become a fashionable term in investment banking. However the concrete trading strategies implemented are in most cases proprietary knowledge. We investigate a set of Xetra order data to find traces of algorithmic trading by studying the lifetimes of cancelled orders. Even though it is widely agreed that an algorithm must randomize its order activities to avoid exploitation by other traders, we still find systematic patterns in the submission and cancellation of certain Xetra orders, indicating the activity of algorithmic trading. Therefore these previously undiscovered effects can be used to improve order book forecasts.

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Interday Forecasting and Intraday Updating of Call Center Arrivals

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Accurate forecasting of call arrivals is critical for staffing and scheduling of a telephone call center. We develop methods for interday forecasting and dynamic intraday updating of incoming call volumes. Our approach is to treat the intraday call volume profiles as a high dimensional vector time series. We propose to first reduce the dimensionality by singular value decomposition of the matrix of historical intraday profiles and then apply time series and regression techniques. Both interday (or day-to-day) dynamics and intraday (or within-day) patterns of call arrivals are taken into account by our approach. Distributional forecasts are also developed. The proposed methods are data-driven, and appear to be robust against model assumptions in our simulation studies. They are shown to be very competitive in out-of-sample forecast comparisons using two real data sets. Our methods are computationally fast and therefore it is feasible to use them for real-time dynamic forecasting. Future work is also discussed.

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Do Bookmakers Possess Superior Skills to Bettors in Predicting Outcomes?

Leighton Vaughan Williams
Nottingham Trent University, UK

Recent work has suggested that bookmakers display superior skills to bettors in predicting the outcome of sporting events. In this paper we use matched data from traditional bookmaking and person-to-person exchanges to test this hypothesis. Employing a conditional logistic regression model, we find that betting exchange nominal odds have more predictive value than the corresponding bookmaker odds for 693 horse races run in the UK. We attribute this to the favourite-longshot bias. Secondly, we repeat the regressions for probabilities adjusted for bias, and find that the betting exchanges continue to predict outcomes more accurately, but with weak significance. Finally, to control for potential spillovers between the two markets, we repeat the analysis for cases where prices diverge significantly. In this case the predictive advantage is reversed, with bookmaker odds adjusted for bias yielding more valuable information concerning race outcomes than the exchange equivalents.

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EC8
Contributed Session: Indexes

Wednesday 9:00am-10:30am Room: Empire

Chair: Ataman Ozyildirim
The Conference Board

A Bayesian analysis of a bivariate Holt's model

Ana Corberan, Enriqueta Vercher, Jose D. Bermudez
Universidad de Valencia, Spain

The objective of the present work is to obtain accurate forecasts, both point forecasts and prediction intervals, of future values of two time series with correlated errors at each time point using a Bayesian forecasting approach based on the Holt's model with additive errors.

The stochastic component is introduced by means of additive, independent, homoscedastic and bivariate Normal errors. The data vector is multivariate Normal. Their mean and covariance matrix are functions of the unknows. Then the bivariate Holt's model can be formulated as a regression model. The vector of the regression parameters depend on the initial conditions and the covariance matrix is function of the smoothing parameters and the covariance matrix of the errors, so it is unknown and not diagonal. This fact causes some difficulties that are overcome using 'Monte Carlo statistical methods'.

A real numerical example, using some correlated Stock Exchange indices, shows the behavior of our method.

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Using Response Surface Optimization to Isolate Forecast Information: An Illustration Using a Value-Focused Composite Stock Return Forecasting Model for Active Portfolio Management

Bernell K. Stone
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Using Response Surface Optimization to Isolate Forecast Information: An Illustration Using a Value-Focused Composite Stock Return Forecasting Model for Active Portfolio Management. Response surface methods are widely used for controlled experiments. We show here that response surface methods can be adapted to optimally isolate forecast information from both measurement error and non-forecast variable distortion. We formulate a mathematical assignment program (MAP) that optimally transforms a large sample of stock return forecasts into a cross section of control-matched portfolios. Optimization refers to having the widest possible range of well-ordered return forecasts while making the portfolios identical on ten-plus controls for risk, taxes, and other return-impacting variables. In effect, the MAP enables optimal use of forecast information by producing a wide range of well-ordered forecasts for which non-forecast noise/distortion is almost completely eliminated at the portfolio level. The illustrative return forecasting model uses a composite of eight value measures. An adaptively re-estimated regression on past returns annually updates relative variable weights in the composite forecast. The simple value-focused composite return forecast illustrated here outperforms index averages by more than 4% per year on average after all trading costs for 1996-2005. We claim (and show by example here) that the failure to control well for the many other factors that impact stock returns is the primary reason that most stock return forecasting models perform poorly. .

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A principal component analysis approach to forecast histogram-valued time series. Applications to expected returns in stock indexes

Carlos Mate
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Gloria Gonzalez
University of California-Riverside, USA

Histogram-valued time series (HTS) contain a histogram in each period of time and were presented by Mate et al. (2006) in the last ISF held in Santander. Its background belongs to the symbolic data analysis (SDA) field, an emerging research area in statistics and data mining in this decade. Several procedures have been developed in order to obtain the principal components of interval-valued data and a generalization to a histogram data set has been carried out. This paper provides an original methodology to forecast HTS based on the principal components analysis of the set (or part) of histograms considered. In order to compare the forecasting performance of each principal component a measure based on the classical Theil's U is proposed. This methodology is used to form the forecast of the histogram of returns of the stocks that constitute the IBEX-35 index. Finally, some exciting problems requiring further research are commented on.

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Releases of Previously Published Information Move Aggregate Stock Prices

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We document that a recurring release of already publicly available macro economic information, in the form of the U.S. Leading Economic Index (LEI), has a significant impact on aggregate stock returns, volatility and volume. This is despite the fact that a) it is widely known that the index is based on previously published data, and b) the exact procedure used to construct the index is also publicly available and, in fact, relatively easy to follow. This phenomenon of course constitutes a violation of semi-strong market efficiency and suggests that aggregate stock prices are not always able to correctly determine the incremental news content of information release. However, the findings could stem from costly information acquisition combined with limits to arbitrage. To test that, we investigate the cross-sectional response to the announcement. Contrary to the information acquisition cost explanation, we find that stocks that have higher sensitivity to macro economic fluctuations respond less to the release of the LEI.

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TS12
Invited Session: Time Series Monitoring

Wednesday 9:00am-10:30am Room: Olmstead

Chair: Wilpen Gorr
Carnegie Mellon University, USA

Time Series Monitoring when the Variance Changes

Keith Ord
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The benefits of using exponential smoothing to monitor a process over time are well-known. However, the limits used to detect changes are usually established once and for all and may become inappropriate if the volatility of the time series changes. We use the innovations (or single source of error) approach to create exponential smoothing models with an evolving variance term so that the threshold limits can be updated on a regular basis. The method is illustrated using data with increasing, decreasing and irregular patterns of variability. The analysis also provides some insight into the imperfect coverage of prediction intervals in past forecasting competitions, where constant variances have typically been assumed.

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Monitoring Multivariate Spatial Time Series Data for Disease Outbreak Detection

Daniel B. Neill
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Automatic disease surveillance systems are essential for early detection of public health threats such as avian influenza or bioterrorism. We have developed a system which monitors electronically available public health data (including hospital visits and pharmacy sales) and automatically detects emerging outbreaks of disease. Given multiple streams of data, each aggregated at the zip code level, we first forecast the expected count for each data stream for each zip code, and then detect spatial clusters where the observed counts are significantly higher than the counterfactual forecasts.

Our current detection method, the ''multivariate Bayesian scan statistic'' (MBSS), combines information from the multiple data streams in a Bayesian framework, computing the posterior probability of each outbreak type in each spatial region. MBSS learns a Gamma-Poisson model for each region from the historical data, and models the effects of each outbreak type on each data stream using expert knowledge. We evaluated MBSS on simulated outbreaks injected into three streams of over-the-counter sales data (cough, fever, thermometers) for Allegheny County, Pennsylvania. At an allowable level of 1 false positive per month, MBSS detected the injected outbreaks in an average of 1.59 days, as compared to 2.23, 2.59, and 1.99 days for univariate Bayesian detectors monitoring each stream respectively. MBSS was also able to characterize outbreaks by pinpointing the affected region, and accurately distinguished between different outbreak types.

This work was supported by NSF grant IIS-0325581 and CDC grant 1 R01 PH000028-01.

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Automated time-series forecasting for biosurveillance

Galit Shmueli
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Howard Burkom, Sean Murphy
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Modern biosurveillance focuses on monitoring daily pre-diagnostic data streams for the purpose of the early detection of natural and bioterror-related disease outbreaks. Current national and regional systems monitor data from a variety of sources (e.g., over-the-counter medication sales, and complaints at visits to emergency departments), which have different characteristics, and are typically non-stationary, noisy, with only short history. Although theoretically it is feasible to search for an appropriate time series model for each time series separately, it is impractical in the automated, real-time biosurveillance setting.

For robust detection performance, alerting algorithms for biosurveillance require input data free of trends, day-of-week effects, autocorrelation, and other systematic behavior. Time series forecasting methods may be used to remove this behavior by subtracting forecasts from observations to form residuals for algorithmic input. We describe three forecast methods that are easily automatable: The methods are (1) a linear regression model using a long historical baseline, (2) an adaptive regression model with a short, sliding baseline, and (3) Holt-Winters exponential smoothing. We compare their predictive accuracy on an authentic dataset of 16 pre-diagnostic daily data streams. Criteria for comparing the forecasts include RMSE, median absolute percent error, and the median absolute deviation.

We find that the median-based criteria show best overall performance for the Holt-Winters method. The mean-based criterion was less conclusive because of the effects of poor forecasts on a small number of calendar holidays. The Holt-Winters method was also most effective at removing serial autocorrelation, with most 1-day-lag autocorrelation coefficients below 0.15. The forecast methods were compared without tuning them to the behavior of individual series (as would be applied in an automated system). We achieved improved predictions with such tuning of the Holt-Winters method, but practical use of such improvements for routine surveillance will require reliable data classification methods.

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Empirical Calibration of Time Series Monitoring Methods

Wilpen Gorr, Jacqueline Cohen, Samuel Garman
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Time series monitoring has the purpose of automatically detecting departures from business-as-usual time trends in settings with large numbers time series. For example, to monitor for large increases of major crimes types in all neighborhoods of a medium-sized city requires monthly review of about 1,500 time series; for a large city its about 15,000 time seriestoo much work for crime analysts using visual inspection. Our research shows that the application of time series monitoring methods can reduce such work loads by 80 percent or more, making it feasible to monitor. Calibration of such methods has relied on simulated time series data, but this approach does not facilitate making tradeoffs between Type I (false positive) and Type II (false negative) errors in detecting large changes. In particular, police wish to reduce false negatives, but selecting parameter values to accomplish this also increases false negatives, thus increasing workloads. The choice of parameter values thus depends on resources available for monitoring and importance of the phenomena being monitored. Hence we introduce a multi-criterion optimization for calibration based on a sample of time series coded for time series step jumps and outliers by domain experts as the basis for evaluation. We use a sample of crime frequency time series and compare four monitoring methods, including the widely-used Trigg tracking signal, the common police method of percentage change, and two additional methods based on standardized data. The Trigg tracking signal is the best method with robust and effective results. Moreover, the proposed empirical calibration method appears attractive for use by practitioners, resulting in tradeoffs much different from those of traditional hypothesis testing. Our current research is on sequences for examining ‘‘hit’’ and stopping rules.

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EC9
Contributed Session: Volatility II

Wednesday 10:45am-11:45am Room: Gramercy

Chair: Terrence Kinal
University at Albany - SUNY, USA

On the Evaluation of Financial Volatility Models

Genaro Sucarrat
Universidad Carlos III de Madrid, Spain

A practice that has become widespread is that of evaluating financial volatility forecasts obtained from discrete time models with high frequency estimates based on continuous time theory. The main motivation behind this procedure is that the high frequency estimates are believed to be more efficient. This gives rise to several methodological issues. First, there is an implicit assumption that the underlying continuous time structure constitutes a more fundamental model than the discrete time model. However, the discrete time model is potentially compatible with more continuous time structures than the postulated one, so one may ask to what extent the postulated continuous time structure constitutes a restrictive assumption. Second, in empirical discrete time models of financial returns the error term and the standardised residuals are derived, since their properties depend on functional form and the explanatory information in the conditional mean and in the variance function. In continuous time structures on the other hand the analogs of the error term and the standardised residual have characteristics entirely determined by the postulated continuous time structure. Since explanatory information is less available at high frequencies, one may question whether it is appropriate to evaluate explanatory models of volatility against high frequency estimated based on continuous time theory.

The contribution of the study is threefold. First, a general framework is developed that nests both continuous time structures and discrete time models of financial returns, and which enables probabilistic reduction analysis of delineating a continuous time structure as the data generating process. Second, operational and practical procedures for the evaluation of discrete time models of volatility against high-frequency estimates of continuous time analogs are proposed. Finally, the issues and procedures are illustrated through an evaluation of an empirical model of exchange rate return that contains orderflow as an explanatory variable.

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Conditional Heteroscedasticity or Stochastic Volatility

News, Announcements, and Stock Market Volatility Dynamics

Jose Gonzalo Rangel
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This paper examines announcement and news effects on stock market volatility in the context of public disclosure of information regarding fundamental macroeconomic variables, monetary policy decisions, and earnings. The return distribution is parametrized using a jump Poisson-Gaussian model with time varying arrival intensity, and a GARCH model. Information surprises and announcements affect conditional volatility through a non-linear channel described by the jump intensity. We find that the day of the announcement, per se, has little impact on jump intensities. However, one exception is the day of employment releases where the jump intensity is significantly large. In contrast, when the surprise component of the announcement is incorporated in the model, inflation shocks show persistent effects and monetary policy shocks show short-lived effects. The jump model provides evidence of heterogeneous volatility persistence and asymmetric effects between positive and negative shocks from different types of news releases.

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Measuring Macroeconomic News and Volatility using Kullback-Leibler Information from Density Forecasts

Terrence Kinal, Kajal Lahiri, Fushang Liu
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Macroeconomic news and its volatility are estimated using successive revisions of fixed target density forecasts via Kullback-Leibler Information. This approach is applied to density forecasts of inflation and real output growth obtained from the Survey of Professional Forecasters.

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C2
Featured Talk

Wednesday 10:45am-11:45am Room: Olmstead

Chair: P. Geoffrey Allen
University of Massachusetts, USA

Auditing Public Policy Forecasting: Climate Change, Gun Control, and Other Issues

J. Scott Armstrong
University of Pennsylvania, USA

Kesten C. Green
Monash University, New Zealand

Major investments are made based on the forecasted effects of governments policies. For example, will more spending on higher education produce net gains to society and students? Will a proposed military action provide greater long term benefits than pacific policies? Our experience and some surveys suggest that forecasting procedures to support policies seldom follow evidence-based principles. Unfortunately, people are likely to falsely conclude that truth emerges when many forecasters use unfounded methods. Using the Forecasting Audit posted at Forecasting principles.com, we examined the primary scientific forecasting papers that have led people to argue for major interventions by governments with respect to climate change. We found forecasting procedures to be inconsistent with a number of forecasting principles.. The type of audit we conducted is not expensive. Such audits provide a rational and structured way to frame debates when examining public policy.

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Comments: **Paul Goodwin**, University of Bath, UK
''Auditing public policy forecasting: Lessons from company forecasting.''
John R. Lott, University of Maryland

J. Scott Armstrong is Professor of Marketing at the Wharton School, University of Pennsylvania. He is one of the founders (and a Fellow) of IIF, IJF and the *Journal of Forecasting*. He is the creator of forecastingprinciples.com, author of *Long-Range Forecasting*, and editor of *Principles of Forecasting: A Handbook of Researchers and Practitioners*. His recent research interests include determining how to forecast the outcomes of conflicts and in applying the Polly vote to political elections.

O6
Contributed Session: Applications

Wednesday 10:45am-11:45am Room: Hudson

Chair: Ondrej Konar
Academy of Sciences of the Czech Republic

Forecasting Volume and Price Elasticity of Mail at the Different Levels of the Material Hierarchies

Tom Zougas
SAS, Canada

Siva Janarthanan, Gabriel Toichoa
Canada Post Corp., Canada

Organizations have embraced Business Intelligence (BI) as a definite means of managing the organization's operations and they are now looking at effective forecasting so that business can plan for their future needs and activities. In addition, businesses look at their products as hierarchies. This project involved a collaborative effort between SAS Consulting and Canada Posts Pricing and Modeling Team to understand the future volumes of mail processed by Canada Post using models for forecasting and econometric models for pricing. The models were developed to represent Canada Post's product offerings at different material levels from total volume down to mail weight categories. The results were then incorporated into Canada Post's BI platform to extend the business' view of operations.

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Forecasting the Gross Foreign Assets Position of the Eastern Caribbean Currency Union

Emefa Sewordor
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The gross foreign assets position of the Eastern Caribbean Currency Union (ECCU) is an important variable in the analysis of the stability of the quasi-currency board arrangement that exists. The ability to forecast movements in the gross foreign assets invaluable for directing the work of the Eastern Caribbean Central Bank's operations and for policy purposes, generally. The forecasts are based on specific assumptions about the underlying nature of the data, including the inherent seasonality that derives from the ECCUs heavy reliance on season-dependent activities, particularly tourism. This article investigates the appropriateness of various statistical forecasting methods for deriving near term forecasts for the gross foreign assets series in the ECCU.

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Nonlinear Mixed Effects Model for Gas Consumption Estimation

Ondrej Konar, Marek Brabec, Marek Maly, Emil Pelikan, Jiri Vondracek, Jana Cermakova
Academy of Sciences of the Czech Republic

A good estimator of natural gas consumption in a time period (e.g. day, month etc.) can be very useful for natural gas distribution companies since they do not measure consumption for all their customers on daily basis. Such a measurement is not feasible especially for small customers (due to their large number and low individual consumption). While average length of consumption reading interval is about one year for small customers in Czech Republic, much finer time resolution is required for various practical purposes. Estimates of daily consumptions can be obtained from various statistical models. On ISF 2006, we presented a nonlinear regression model Gamma which was developed in co-operation with West Bohemian Gas Distribution Company (WBG). Its practical application has been extensive (unbilled revenues estimation, consumption forecasting, etc.). The model took all re gression coefficients as unknown but fixed quantities. Practical experience showed that fixed effects approach can be problematic especially with respect to the individually-specific mean yearly consumption (IYC) as one of models parameters. There might be non-negligible reading errors in routine data, so that individual IYC estimates should be shrunk to the segment average (segments correspond to predefined customer groups with similar behavior). Our new model is formulated as a nonlinear mixed effects model (NLME) as an extension of the previous specification. It takes IYC as a random quantity coming from a common (lognormal) distribution. In effect, this leads to desirable shrinkage and to other nice properties of the estimates. We will illustrate models performance on real-world data obtained from a routine WBG database and compare it to the previous fixed-effects version. The work is supported by the Grant Agency of the AS CR, grant No. 1ET400300513.

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EC10
Invited Session: Big Data

Wednesday 10:45am-11:45am Room: Duffy

Chair: Domenico Giannone
ECARES, Belgium

Forecasting Housing Prices with Many Potential Predictors

David E. Rapach, Jack Strauss
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A wealth of plausible predictors exist for forecasting real housing price growth in individual U.S. states. Potential predictors include state-level economic variables (such as income and employment), regional housing market indicators, and numerous national economic variables. The plethora of potential predictors--and the fact that the predictive ability of individual variables can vary markedly over time--make it difficult to identify a priori the particular variable or small set of variables that are the most relevant for forecasting housing prices in an individual state for a given time period. In the present paper, we analyze different methods for generating real housing price growth forecasts for individual U.S. states in the presence of many potentially relevant predictors. The methods we consider include: (i) a general-to-specific procedure, where the general model includes all of the potential predictors and a decision rule is used to select the most relevant predictors; (ii) a bootstrap aggregating (bagging) augmented version of the general-to-specific procedure in which bagging is introduced to produce a more stable decision rule; (iii) a diffusion index model based on a small number of extracted factors; (iv) combinations of individual forecasts from autoregressive distributed lag (ARDL) models, where each ARDL model is based on a potential predictor. We analyze these different forecasting methods relative to standard benchmark forecasting models for various out-of-sample periods over the last two decades.

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Combining disaggregate forecasts versus disaggregate information to forecast an aggregate

Kirstin Hubrich
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David Hendry
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We compare combining disaggregate forecasts to forecast the aggregate variable of interest with combining disaggregate information, that is including disaggregate variables or their estimated factors in the aggregate model, and with only using lagged aggregate information in forecasting the aggregate. We show theoretically that combining disaggregate information in predicting the aggregate should in most cases outperform the alternative methods in population. We present analytical results on the effects of changing coefficients, mis-specification and estimation uncertainty on the relative forecast accuracy of the different approaches to forecast an aggregate. We also consider the role of changing weights and a changing correlation structure, and present conditions under which a ranking between different approaches to forecast an aggregate is possible. Additionally, we analyse the effect of estimation uncertainty and misspecification as well as the stochastic structure of the disaggregate components and their co-variances on the relative forecast accuracy by Monte Carlo simulations. We investigate whether our theoretical predictions can explain our empirical findings by analysing the relative forecast accuracy of combining disaggregate information versus disaggregate forecasts or just using past aggregate information to forecast aggregate US inflation.

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A Quasi Maximum Likelihood Approach for Large Approximate Dynamic Factor Models

Domenico Giannone
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Lucrezia Reichlin
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Catherine Doz
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This paper considers quasi-maximum likelihood estimations of a dynamic approximate factor model when the panel of time series is large. Maximum likelihood is analyzed under different sources of misspecification: omitted serial correlation of the observations and cross-sectional correlation of the idiosyncratic components. It is shown that the effects of misspecification on the estimation of the common factors is negligible for large sample size (T) and the cross-sectional dimension (n). The estimator is feasible when n is large and easily implementable using the Kalman smoother and the EM algorithm as in traditional factor analysis. Simulation results illustrate what are the empirical conditions in which we can expect improvement with respect to simple principle components considered by Bai (2003), Bai and Ng (2002), Forni, Hallin, Lippi, and Reichlin (2000, 2005b), Stock and Watson (2002a,b).

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FM19
Contributed Session: Perspectives on Forecasting II

Wednesday 10:45am-11:45am Room: Soho

Chair: Marcus O'Connor
University of Sydney, Australia

Forecasting and Foresight

Martin Amsteus
Vaxjo Universitet, Sweden

In this paper, the argument is put forward that forecasting is a vital component of foresight. The paper draws on the notion that foresight has always been the goal of the best strategic planning and decision-making processes; that as such it plays a critical role in all major theories of competitive advantage; that each of these theories implicitly assumes that managers have some degree of foresight about the emergence of an advantage; that absent foresight, these theories would, in practice, be indistinguishable from luck. Foresight, which has been labelled one unique feature of man, is defined as behaviour (e. g. probability for a behaviour and as such a basis for all purposeful acts) along four sub-variables; proneness to analyse future state or states, proneness to move future state or states ahead in time, proneness to perceive future state or states clearly, and proneness to act upon perceived future state or states.

By relating forecasting to foresight, the former is related to the evolution of the human species, radical behaviourism and (artificial) intelligence, as well as to the notion of consciousness (e.g. it brings the field closer to biology and the survival of the species). By making this connection, from an evolutionary perspective, it is shown that a more integrated approach suggests important research areas, which are defined in terms of forecasting, both on individual level and on various organizational levels (e.g. firm, business unit, corporate et cetera), forecasting and strategy, as well as several business level performance variables (e. g. product development, degree of internationalization, growth, size and profitability).

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Forecasting Perspectives: Alternative Ways of Thinking, Seeing and Doing

Kazem Chaharbaghi
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All forecasting takes place out of background assumptions that provide taken-for-granted understandings of how the world works. This study exposes these assumptions by introducing a framework that employs two dimensions for its analytic distinctions: ''continuity-discontinuity'' and ''emergent-resultant''. In the former dimension, continuity refers to a tendency that reinforces the status quo and stability where the future is considered to be a simple extension of the past or an extrapolation of past trend lines. Discontinuity on the other hand, as an opposing tendency, emphasises transformation and radical change where the future is viewed as representing a departure from the past. The ''emergent-resultant'' dimension is based on the concept of emergence coined by Lewes in 1875 to denominate something new which could not be predicted from the elements constituting the preceding condition. In accordance with this, Lewes distinguishes ''emergents'', that is, properties whi! ch cannot be predicted, from ''resultants'', that is, properties which can be predicted. Within the context of forecasting, the former shifts the emphasis from a single future to a range of alternative futures, including, for example, those deemed probable, those considered as possible, although not necessarily probable, and those viewed as the unintended consequences of past decisions and actions. The ''continuity-discontinuity'' and ''emergent-resultant'' dimensions provide four alternative forecasting perspectives, the differences amongst which can be shown through their assumptions concerning the future which in turn determine the way in which the world is understood to work. These assumptions are:

1) The past repeats itself or past trends will continue. 2) New trends and discontinuities are predictable. 3) The consequences or effects of existing courses of action or direction cannot be predicted. 4) The future cannot be predicted.

The importance of these assumptions cannot be underestimated because it is ultimately these assumptions that determine what forecasters and futurists are able to say about the future.

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The Utility of Systems Thinking and Systems Dynamics on Forecast Accuracy

Marcus O'Connor, Rajat Dhawan, Mark Borman
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Systems thinking and system dynamics are two offshoots of general systems theory that are used extensively for decision-making in complex feedback systems. Systems thinking provides purely qualitative tools such as causal loop diagrams and system archetypes to help in the analysis of systems. System dynamics on the other hand is a quantitative extension of the systems thinking phase and involves computer modelling and simulation using stocks and flows. These methodologies claim to enhance our mental models by enabling us to understand the elements of dynamic complexity (such as feedback loops and time delays) thereby improving performance in dynamic decision-making tasks and improving the accuracy of forecasts. However to date these claims have not been subject to rigorous experimental testing. Further, there is a long-standing debate about the relative usefulness of system dynamics over systems thinking. Their exploration in the field of forecasting has not been subject to comprehensive test. A pre-test, post-test experiment was designed in which two interventions (systems thinking and systems dynamics) were provided, one after the other, to the same cohort. Using a HR case study, participants were asked to forecast workforce levels at 4 specific points in time. The case study was reasonably complex involving self-reinforcing feedback loops, delays in the impact of decisions and goal seeking behaviour. Results show that, whilst systems thinking tools and concepts improved the way people were able to conceive of the dynamics of the problem, they did not improve forecast accuracy. However, the addition of systems dynamics tools and software enabled people to both understand the dynamics of the problem and improved forecast accuracy considerably.

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FM20
Invited Session: Space-Time Forecasting

Wednesday 10:45am-11:45am Room: Empire

Chair: Dana Draghicescu
City University of New York, USA

Space-time models: a spatially-dependent filtering approach

Peter F. Craigmile
The Ohio State University, USA

Many phenomena in nature are measured across space and through time. Investigating possible space-time interactions, in the presence of uncertainty, is key to understanding the science. There is no opportunity to study these interactions if we marginalize over time or space. Space-time statistical methodologies should nonetheless be faithful to methodology in time series analysis and spatial statistics. In this talk we propose models that are defined as spatially-dependent filterings of space-time innovation processes that are realizations of geostatistical processes. The innovations do not need to be invariant with respect to time. These models include the usual class of linear time series models, as well as standard geostatistical models, both Gaussian and non-Gaussian. The processes do not need to be stationary in time or in space, and build on the growing literature concerning nonstationary models. Leveraging both the innovations, as well as the filtering operations used to define these space-time processes, we use ideas from spatial statistics and time series to develop methods for inference and prediction in a space-time context.

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Calibrated probabilistic forecasting at the Stateline wind energy center: The regime-switching space-time (RST) method

Tilmann Gneiting, Kristin Larson
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Marc G. Genton
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Eric Aldrich
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With the global proliferation of wind power, accurate short-term forecasts of wind resources at wind energy sites are becoming paramount. Regime-switching space-time (RST) models merge meteorological and statistical expertise to obtain accurate and calibrated, fully probabilistic forecasts of wind speed and wind power. The model formulation is parsimonious, yet takes account of all the salient features of wind speed: alternating atmospheric regimes, temporal and spatial correlation, diurnal and seasonal non-stationarity, conditional heteroscedasticity, and non-Gaussianity. The RST method identifies forecast regimes at the wind energy site and fits a conditional predictive model for each regime. Geographically dispersed meteorological observations in the vicinity of the wind farm are used as off-site predictors.

We applied the RST technique to 2-hour ahead forecasts of hourly average wind speed at the Stateline wind farm in the US Pacific Northwest. In July 2003, for instance, the RST forecasts had root-mean-square error (RMSE) 28.6% less than the persistence forecasts. For each month in the test period, the RST forecasts had lower RMSE than forecasts using state-of-the-art vector time series techniques. The RST method provides probabilistic forecasts in the form of predictive cumulative distribution functions, and those were well calibrated and sharp. The RST prediction intervals were substantially shorter on average than prediction intervals derived from univariate time series techniques.

These results suggest that quality meteorological data from sites upwind of wind farms can be efficiently used to improve short-term forecasts of wind resources. It is anticipated that the RST technique can be successfully applied at wind energy sites all over the world.

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Statistical downscaling of chemical transport model ozone forecasts over Atlanta

Serge Guillas, Jinghui Bao, Yunsoo Choi, Yuhang Wang
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The Regional Air Quality forecAST (RAQAST) model is a a regional chemical transport modeling system for ozone and its precursors over the United States. Since the grid size is 70 by 70 km, forecasts can not be made for a specific surface site. We use EPA monitoring stations from the Atlanta area to downscale and improve local forecasts using RAQAST outputs. We use the MDC (Model Diagnostic and Correction) approach. First, we regress the observations on the model outputs with an autoregressive noise component. Second, we regress the residuals of this first regression on variables associated with wind speed, precipitation amounts and the diurnal cycle. Deficiencies of 3-D model results are identified and corrected. Evaluation using measurements for a different period confirms that the statistically-adjusted outputs reduce forecast errors by up to 25%.

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TO2
Contributed Session: Tourism II

Wednesday 9:00am-10:30am Room: Duffy

Chair: Brian W. Sloboda
US Department of Transportation, USA

Events that Affects Inbound Tourist Flows to Indonesia

Margaret Tan, Hsin-Hong Kang
National Cheng Kung University, Taiwan

In the past 10 years, there has been instability for the demand tourism for Indonesia. Indonesia's situation has been colored by uncertain events such as Asian financial crisis, terrorist attacks, tsunami, and other major events that absolutely could influence tourists decision in determining their decision. Impacts of crises and disasters on tourism demand are logically understood. However, how would this kind of unpredictable events affect the inbound tourist flows to Indonesia? This study tries to identify important factors that would affect inbound tourist flows to Indonesia. Quarterly data are used in this study covering 39 observations from top 10 countries. Unit root test has been used to assess that all the estimated variables are stationary, and then a demand model is formed by including four indicator variables to measure how significant have the events influenced the inbound tourist flows to Indonesia. Empirical results revealed that the chosen economic variables do not significantly reduce the foreign tourists to travel to Indonesia, while first bombing Bali outbreak have considerable impacts.

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Short-Term Forecasting of World Tourism

Egon Smeral
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Whereas many studies have already been done on short-term tourism forecasting approaches at a country level or for a group of countries, little attention has been given to developing short-term forecasting approaches for highly aggregated levels such as world tourism and/or tourism in world sub-regions, especially on a monthly base. Building multivariate causal models for world tourism or for sub-regions could turn out to be very difficult as the necessary short-term information, such as recent monthly data on the independent variables determining tourism demand, is either not available or very labour- and cost-intensive to obtain. In order to solve the short-term forecast problem on a global scale, a quasi-causal model was designed to explain international tourist arrivals for the world as a whole and for Europe in particular. This model is based on a REGARIMA approach which uses as its exogenous variable the flexible trend of the arrivals being explained through the model. The flexible trend was identified by the Hodrick-Prescott filter method and indicates in the model the important exogenous aggregated information. The Holt-Winters method was chosen to forecast the flexible trend. ARIMA models were developed and ''absolute no change'' forecast values computed in order to benchmark the monthly forecast accuracy of the REGARIMA model. The forecast accuracy of the models tested is measured by the mean absolute percentage error. The study shows that, based on out-of-sample forecasts, the simple ARIMA approach was in general not outperformed by the more complex quasi-causal REGARIMA approach. However, both approaches outperformed the ''absolute no change model''.

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The Effects of Terrorism on the Tourism: Another Look

Brian W. Sloboda
US Department of Transportation, USA

Tourism is one of the largest industries and many open economies especially small nations rely heavily on tourism as a major revenue source. Business and public-policy officials are often interested in the impact of tourism at all levels. Thus, the terrorism can hinder the tourist sector by keeping tourists away after major terrorist attacks, and in the long-term the indirect costs of terrorism include greater expenditures for advertising in order to attract tourists, the rebuilding of tourist facilities, and providing greater security measures to lessen terrorist activities.

In recent years there has been an increase in the number of heinous terrorist events which have altered travel behavior because of the fear of a terrorist incident while on travel. Enders and Sandler (1991); Enders, Sandler, and Praise (1992); Drakos and Kutan (2003); Aly and Strazicich (2000); Sloboda (2003, 2006) have provided various model to assess the effects of terrorism on tourism on a nation or a group of nations.

In this paper, an analysis of the effects of terrorism on tourism will be assessed using VARMAX models rather than VARMA or VAR models since the latter models assumes that all variables of a system are determined within the system or endogenous. However, the generation process of a variable may be affected by other observable variables which are determined outside the system which are exogenous variables. The imposition of exogeneity, can imply a reduction of the number of parameters and also an improved precision of forecasting. These models are called VAR models with eXogenous variables (VARX models).

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Forecasting Accuracy of USA Regional Tourist Arrivals

Jo Chau Vu, Lindsay Turner, Hubert Fernando
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Forecasting of international tourist regional arrivals within countries has become a more pressing issue as the total volume of travel increases. Increasing volumes have impacted on regions that now compete amongst themselves to increase the return from international tourism. Considerable research has been done on comparative research models for forecasting tourist arrivals nationally. However, no published study has tested regional international arrival forecasting accuracy. This study focuses upon the major ports of entry to the USA, using international arrivals data, over the forecast period 1998 to 2003. Forecasts are run using the Basic Structural and ARIMA models on monthly data with an ex ante forecasting period 2004 to 2005. Accuracy of the arrival forecasts is measured for each region, and compared with forecasts for the whole of the USA. Model selection for the ARIMA analysis is done using forecasting accuracy selection on a trial and error basis, not just assessment of unit roots. In this process ARMA models will also be tested. And, where necessary dummy intervention variables will be added to allow for some crisis events, including the Gulf and Afghanistan conflicts and SARS. Additionally, the forecasts when summed from the disaggregated regional flows are compared on the basis of forecast accuracy with the forecast of the total flow for the non-disaggregated data. This tests the more general issue of the accuracy of disaggregating tourism time series, that is, are the regional forecasts as accurate as forecasts run from NTO tourist arrivals data for the whole country? Comparison is made of the forecast growth rates regional and nationally to compare the relative accuracy of the different databases and the different levels of aggregation. Forecasts of guest arrivals are also made into the future for 2008-2010 for both the USA as a whole and for each of the main port of entry / regions. These forecasts will provide interesting USA regional forecasts for the first time.

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FM21
Featured Talk

Wednesday 11:45am-12:45pm Room: Olmstead

Chair: Michael Lawrence
University of New South Wales, Australia

How can short-term demand forecasting in companies be improved -- and when does judgement help?

Robert Fildes
Lancaster University, UK

Paul Goodwin
University of Bath, UK

Accurate forecasts are crucial to successful planning in many organizations and in 2001 forty international experts published a set of principles to guide best practice in forecasting. Some of the principles relate to the use management judgment. Almost all organisations use judgment at some stage in their forecasting process, but do they do so effectively? While judgment can lead to significant improvements in forecasting accuracy, it can also suffer from biases and inconsistency. The principles therefore indicate how forecasters should use judgment and how they should assess its effectiveness. The question we examine is whether judgment is used according to these established principles. We conducted a survey of over 120 forecasters to investigate whether their forecasting procedures were consistent with the principles. In addition, we conducted four in-depth case studies. We found examples of good practice. However, many organizations could improve forecast accuracy if they followed basic principles like limiting judgmental adjustments of quantitative forecasts, asking managers to justify their adjustments in writing and assessing the track record of judgmental interventions. While almost all the respondents believed that forecasting accuracy was important all too few were taking the basic steps needed to achieve that goal.

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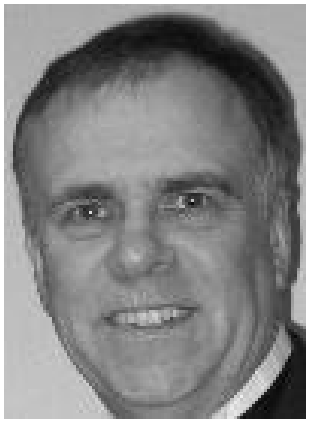

Robert Fildes is Head of the Department of Management Science, and Director of the Center of Forecasting of Lancaster University, UK. He has served as the President of IIF and Editor-in-Chief of International Journal of forecasting. His research interests include forecast evaluation, selection of forecasting methods, and development of forecasting systems to support production, inventory and supply chains.

Paul Goodwin is Professor of Management Science at the University of Bath, UK. He is on the Board of Directors of IIF, and an associate editor of *IJF*, *Foresight*, and the *Journal of Behavioral Decision Making*. His current research interest lies in the area of integration of judgment and models in forecasting and decision making. His co-authored book *Decision Analysis for Management Judgment* (2004, Chichester: Wiley) is in its 3rd edition.

EN4
Contributed Session: Electricity IV

Wednesday 11:45am-12:45pm Room: Duffy

Chair: Arthur Maniaci
New York Independent System Operator, USA

Short-term Forecasting of French National Electricity Load using Hourly Periodic State Space Models with Nonlinear Regression Effects

Virginie Dordonnat
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Siem Jan Koopman, Marius Ooms
VU University Amsterdam, The Netherlands

The statistical modelling and forecasting of hourly electricity load is a challenging task given the many seasonal, weather and special-day effects that affect the use of electricity by business and domestic customers. In this paper we present a model based on stochastically time-varying processes that account for changes in customer behavior and in utility production efficiencies. The model is periodic: it consists of different equations and different parameters for each hour. The dependence between the equations is introduced by covariances between disturbances that drive the time-varying processes. Therefore the model needs to be estimated simultaneously. A successful model needs to consist of components that represent trends, seasons at different levels (yearly, weekly, daily, special days and holidays), short-term dynamics and weather regression effects including nonlinear functions for heating effects. The model is sufficiently flexible to account for time-varying portfolio sizes which can be caused by market deregulation. The implementation of our electricity load forecasting procedure is based on the multivariate linear Gaussian state space framework. The data-set consists of nine years of hourly electricity load supplied by Electricit de France (EDF). The analysis concentrates on a peak and an off-peak hour. Given the length of our data set, many features of our model can be readily estimated including yearly patterns and their time-varying nature. The first part of our analysis is based on the univariate modelling of each hour. The models are the same for each hour but are estimated separately. Our diagnostic statistics and graphs present evidence of significant correlations between the hourly components. We therefore pursue the analysis with a simultaneous treatment of the hourly models including correlations between the components. The empirical analysis is concluded with a forecasting assessment based on up to 10 day ahead hourly forecasts.

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A Hybrid Model To Forecast Electricity Market Prices

Rosario Espinola Vilchez
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During the last two decades the electricity market has moved from a centralized operational approach to a competitive one. Price forecasts embody crucial information for producers and consumers when planning bidding strategies in order to maximize their benefits. This work compares the performance of different Hybrid Models for short-term electricity price forecasting for lead times up to a day ahead. The Hybrid Models considered in this work combine Linear Transfer Function models (LTF) with nonlinear Multilayer Perceptrons (MLP). The methods are compared using a time series of hourly prices from the Spanish electricity market which is modeled as a function of the expected electricity load and the production covered in the previous days by different technologies: nuclear, coal, fuel, gas and hydro. The hourly data from the Spanish electricity market corresponding to year 2005 have been used to estimate the parameters of the Hybrid Model. This estimated model is used to forecast the hourly prices for the whole year 2006. Also, in this work has been proposed to estimate the parameters of the Hybrid Model for every week to forecast (168 hourly prices) in the year 2006 and the results have been compared.

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Thermal Stress Testing & Other New Ideas for Neural Net Models

Arthur Maniaci
New York Independent System Operator, USA

The New York Independent System Operator maintains the reliability of the bulk power system in New York and administers the state's wholesale competitive power market. Each day, hourly forecasts of how much power is needed are prepared using neural net models. On a typical day, the forecast accuracy is about +/-2%. But under-prediction of peak demand at extreme temperatures poses a significant problem. It can result in lower system reliability and higher price volatility. This presentation discusses methods to diagnose and correct under-prediction in neural net models, with an emphasis on extreme summer conditions. It also explores new functional forms that address this under-prediction bias mathematically.

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BC16
Contributed Session: Exchange Rates III

Wednesday 9:00am-10:30pm Room: Gramercy

Chair: Chaoyu Zheng
Renmin University, China

Alternative Approach to the Unbiased Forward Rate Hypothesis Puzzle: application of the Smooth Transition Autoregression (STAR) model in foreign exchange market

Lumengo Bonga-Bonga, Semiyou Raphiou
University of JHB, South Africa

The Unbiased forward rate hypothesis (UFRH) stipulates that the forward rates should be a perfect predictor for the future spot rates. A number of studies conducted to test the UFRH have come to the conclusion that the hypothesis does not hold. This phenomenon is dubbed as the UFRH puzzle. A profound scrutiny of these studies has established that most of them make use of a linear model in establishing the relationship between the forward rate and the future spot rate. This study establishes that the use of a linear model in testing the UFRH can lead to the misspecification problem and be at the basis of the puzzle. To remedy to the misspecification problem, this study makes use of the nonlinear method of the class of the Smooth Transition Autoregression (STAR) model in assessing the relationship between the one-month rand and dollar forward rates and the future spot rates. The study finds the existence of three regimes in this relationship. In the lower and upper regimes, the UFRH does not hold and there is a possibility of arbitrage opportunity by investors. In the middle regime, this study establishes that the UFRH hold and there is therefore no arbitrage opportunity by investors in this regime. Furthermore, in forecasting the future spot rates from the forward rates, the nonlinear model performs better than the linear model while using criteria such as the root mean square error (RMSE) and the mean absolute error (MABE).

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Forecasting the exchange rate in South Africa: A comparative analysis

Ilsa Botha, Marinda Pretorius
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Univariate time series analysis and forecasting are extensively applied in research across various disciplines. In economic time series analysis, it is often required to model several time series jointly. Multivariate time series forecasting is however still not generally used. This paper examines the South African exchange rate, by specifically identifying the main determinants of the exchange rate using the variance decomposition method. The identified determinants will be used to specify a multivariate model for the exchange rate of South Africa. The forecast accuracy and the stability of this model will be compared to the performance of a simple univariate model.

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Dynamic PPP Theory: Concept, Evidence and Application

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This paper attempts to found an analytical framework of the dynamic Purchasing Power Parity (PPP) theory for developing countries, and apply it to the situational forecast of Renminbis appreciating trend. The main content is developed along the logic sequence from theoretical framework to econometric analysis to forecasting application, and includes 3 parts as follow.

Part 1: Structural and Dynamical Framework. A 2-country, 2-sector international economy is sketched to describe the structural properties in national and international economy, and the dynamic PPP theory is consequently built to model such structural variables as the marketization and openness of national economy and the integration of international economy. For developing countries, the PPP theory characterizes both the systemic deviation of exchange rate from the traditional PPP level, and the persistent appreciation of exchange rate, driven by economic growth, toward the traditional PPP level.

Part 2: Econometric Model Based on Cross-nation Data. The econometric analysis is implemented with the cross-nation data abstracted from IMF WDI database, and establishes an econometric model of compound growth for the dynamic PPP theory, in which the systemic PPP deviation of exchange rate and its intertemporal evolution are determined by and only by national income (per capita). The robustness of the typical econometric model is confirmed through structural stability test and variable representativeness test.

Part 3: Scenario Forecasting of Renminbi Revaluation. After the typical econometric model refined to its computable version, Renminbis revaluating trend is scenario forecasted on the basis of the computable dynamic PPP theory. The annual appreciation rate and the cumulative appreciation level of Renminbi real exchange rate in 2006-2010 are calculated according to the situational combination of the high and low economic growth with the full and partial exchange rate equilibration, to offer some numerical reference for Renminbi corrective adjustment the near future.

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Inference in Artificial Neural Networks: Testing Market Efficiency for the Brazilian Exchange Rate

Andreza Aparecida Palma, Alexandre Sartoris, Rodovia Araraquara-Jau
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This paper aims to test, using ANNs (artificial neural networks), the hypothesis of market efficiency for the Brazilian exchange rate from 1999 to 2004. In order to do this, it will be used the method of partial derivatives suggested by Racine and White(2001). The first step is to choose network architecture, following by weights estimation and, at last, test according to the suggested procedure. Until not long ago, one of the disadvantages often mentioned about ANNs was the lack of an existing method for doing formal statistical inference with those models (see, for instance, Zhang et al., 1998, p. 56). However, Racine and White (2001) have shown that it is possible to use ANNs, more precisely, MLP (multi layer perceptron) networks to accomplish formal inference, using bootstrap techniques. By doing that, it is possible to carry out hypothesis tests about individual and joint significance of the inputs in an ANN. Since a MLP network has the capability of extract complex nonlinear relationships, inference based in such models becomes a very powerful tool of analysis. In this work our interest is to test the weak form of EMH (efficient market hypothesis) for the exchange market. In order to do this, we are going to verify if the past values (lags) of the exchange rate are significant when it comes to forecast its present value. Usually, EMH tests are performed assuming a linear structure to the series. The ability for forecasting depends mainly on the success of the nonlinear models. Since ANNs do have the capability of extracting nonlinear relationships without specification of a functional form, we will probably have a better result for the test made in an ANN than one made in a traditional model.

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F12
Contributed Session: Information and Security

Wednesday 11:45am-12:45pm Room: Soho

Chair: Sanjay Goel
University at Albany - SUNY, USA

How to get a low price on your next software development project and why you should avoid it

Magne Jorgensen
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Software providers are well known for over-optimistic forecasts of how much the development of software systems will cost. We claim that the software clients, to a far greater degree than is commonly believed, are responsible for the providers over-optimism. Our claim is based on empirical studies of how client controlled factors impact the level of optimism in providers software development cost forecasts. The studies suggest that forecasting over-optimism is related to clients who communicate unrealistic price expectations or present attractive future opportunities related to winning the bidding round systematically. The studies also suggest that there are commonly used formats of software project bidding processes that strongly increase the risk of selecting providers with prices based on over-optimistic cost forecasts. We find, for example, that bidding processes with negotiation tend to increase the level of over-optimism when the negotiation involves asking for price updates on a reduced version of the initial software requirements. Evidence suggests that the clients may not benefit from a low price based on an over-optimistic cost forecast. One reason for this, applying concepts from the principal-agency theory, is the high level of information asymmetry in most software development project. As an illustration, the clients' poor ability to specify and monitor software quality attributes, such as the maintainability of the software, makes it possible for the providers to deliver software with poorer than expected quality. We observe that social factors that otherwise may be sufficient to avoid opportunistic behaviour by the clients, e.g., the software developers self-imposed code of ethics, are less important in situations with over-optimistic effort estimates, e.g., in situations where the provider tries to avoid financial losses. Based on the above findings we outline elements of how the bidding processes should be designed to reduce the probability of receiving bids based on over-optimistic forecasts.

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The Impact of Uncertainty Information in Judgmental Forecasting and Decision Making

Jeffrey Lim, Marcus O'Connor, Maurice Peat
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In todays competitive and dynamic business environment, the use of decision aids, utilizing modeling and simulation techniques, is increasingly adopted and well-regarded in decision making processes to improve forecasting quality despite showing mixed results in their effectiveness. Predictive ability and increased reliance on decision aids are two key issues continually surrounding research in academia and practitioners. This research extends a previous study which examined the usefulness of decision aids by requiring subjects to forecast a successful launch between choices of two products and whether the simulation results generated by the decision aid actually help forecasters in their judgment and decision making. In experiments carried out over a three year period, multiple groups of subjects were presented with uncertainty information in varying nature (symmetric versus asymmetric) and structure (histogram versus triangle distribution) representations enabling them to forecast the products profit potentials and risk levels. Subjects forecasts using @Risk (a business simulation program incorporating the Monte Carlo technique) across the years were then compared with their corresponding simulated benchmarks. Results from these experiments revealed three key issues contributing to the debate on the usefulness of decision aids. Firstly, anchoring and adjustments by subjects based on their simulated results were not evident, indicating that subjects showed full reliance on the decision aid when making the required forecasts. Secondly, the degree of symmetry (nature) and shape of distribution (structure) played major roles on how the decision aid actually handled the uncertainty information. They influenced the forecast estimates and outcomes generated by the decision aid using the Monte Carlo technique. This subsequently impacted on the decision aid as well as subjects dependence on the decision aid to handle the uncertainty information when making forecasting decisions.

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Aspects of Information Aggregation - A Comparison of the Delphi Method and Prediction Markets

Andreas Graefe, Christof Weinhardt
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Prediction markets have shown to perform well in forecasting future events. A prediction market is a structured approach for the generation of an aggregated group opinion by providing iterative feedback about the information of others and ensuring the anonymity of participants. Hence, from a methodological perspective prediction markets possess similar characteristics compared to the well-established Delphi method. At present, the literature lacks a thorough and systematic description of the similarities and differences of both methods, which is indispensable for the appropriate use and classification of prediction markets in the field of forecasting. It is the main aim of the present paper to address this deficit by providing a detailed comparison of prediction markets and Delphi studies with respect to the central process of information aggregation. In particular, a conceptual framework is used to structure and analyze facts and findings from an in-depth literature analysis. We identify fundamental differences in the information aggregation process of both methods concerning general characteristics as well as operational, content, and reliability aspects, which are decisive for their field of application, and raise topics for further research.

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O7
Contributed Session: Marketing

Wednesday 11:45am-12:45pm Room: Hudson

Chair: Christian Slamka
University of Guelph, Canada

Estimating Retail Category Demand Using Trade-Area Demographics

Joy Joseph, Aman Nanda
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Retail Chains determine floor space allocation for different product categories based on sales potential and profitability of each category. Overall profitability of any store in the retail chain is heavily dependent on appropriate allocation of total available space in the store to different categories. We demand category differences based on distribution of demographic factors in the store trade-area. Traditional models measure the relationship between each individual category consumption and demographic factors. This ignores the inherent co-dependence in consumption between categories. Alternative options like Structural Equation Models are more complex to implement. We use a K-Means Cluster approach to identify store performance clusters using individual category contribution to total sales as clustering criteria. We then develop a Multinomial Logit Model to measure relationship between cluster membership and demographic characteristics for each cluster estimated by aggregating Census data. The parameters from the estimated MNL model are then used to score new stores to estimate probabilities of out-of-sample stores being in a particular cluster. Probability weights can then be applied to cluster means to estimate average sales for each category. Additional space and capacity allocation can then be then be made for a category in stores that are over the national average sales for that category.

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Do Price changes predict Profitability?

Vinay Kanetkar
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How does one forecast the effect of price changes on a firm's profitability? In this paper, literature on this issue is reviewed. Unfortunately, there is neither analytical literature nor there is much empirical literature on this topic. Development of analytical and statistical model lead to novel approach to predict effect of price, variable cost and quantity changes on firm's profitability. As a by-product of this work, it is possible to estimate price elasticity for a firm using publicly available income statements.

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Measuring the Value of Events with Prediction Markets

Christian Slamka
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Arina Soukhoroukova, Martin Spann
University of Passau, Germany

Event studies in finance are a powerful tool to assess the impact of past events and thus deriving forecasts of comparable events in the future. However, for many events, appropriate financial data may be unavailable. Prediction markets (PMs) can potentially be used as a substitute or additional data source because with continuous trading, events are continuously incorporated into stock prices and are thus being evaluated. In PMs, virtual stocks are traded on a virtual market place to forecast the outcomes of future forecasting goals such as election results, athletic events, new product sales or internal project deadlines. In such applications, PMs have been found to be an efficient and accurate method for forecasting and are currently emerging to further fields. The appeal of using PMs for event analysis is that nearly any forecasting goal can be modeled as a virtual stock. However, PMs differ from financial markets with respect to market design, length of runtime, monetary incentives for traders, and liquidity. The objective of this paper is to adapt the event study methodology for the specific use in PMs. We analyze theoretical requirements, show which different designs of PMs can occur and how to deal with these designs in event studies. We validate our approach with an intra-day analysis of two data sets of PMs of a major soccer tournament with over 6,000 participants each. Both PMs differ in market designs, incentive schemes for traders and liquidity. Based on the results, we finally discuss potential applications.

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TO3
Contributed Session: Transportation

Wednesday 11:45am-12:45pm Room: Empire

Chair: Peg Young
US Department of Transportation, USA

Structure of Passenger Demand in the United States: An Econometric Time Series Analysis of Domestic Air Transportation

Dipasis Bhadra, Jackie Kee
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The air transportation industry in the United States (US) has undergone significant restructuring, especially over the last five years. Some of these changes have reflected the pressure that was created by the steady emergence and expansion of the low-cost carriers (LCCs). Changes in the cost structure have been the focus of many studies. However, changes in the demand structure have not been studied in rigorous detail. The analysis of the sensitivity of the factors impacting demand is a key to understanding the changing nature of the industry and improving the demand forecasts. Many of the strategic and operational decisions that are made today are influenced by the forecasts based on fundamental characteristics of the demand structure. In this study, we propose an econometric framework that estimates the inherent structure of demand by capturing income, price and demographic changes in domestic origin-destination market pairs. The econometric model will be estimat! ed for consecutive time periods and the resulting time series of model parameters will be analyzed to enhance our understanding of the air transportation forecasts.

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The use of Conditional Demand Analysis in the Forecasting and Updating of Origin-Destination Matrix

Hing-Po Lo, Yee-Wan Tang
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Origin-Destination (OD) matrix is the fundamental information in planning and managing our transportation system. With the OD matrix, traffic engineers can make appropriate planning decisions in a bid to release the traffic burden on the congested roads. Traditionally, the conventional 4-step transportation model has been widely used in the estimation of OD matrix and link choice proportions for more than two decades. However, this transportation model requires the extensive use of data collected via large-scale household or roadside surveys and the cost in collecting sufficient information through large-scale surveys is usually very high. Thus, it is impossible for transport engineers to use this traditional method to make short term forecast of the OD matrix regularly. To alleviate the cost and time of conducting expensive and time consuming household or roadside survey, many traffic engineers start using real-time observed traffic counts, which can be measured by road detectors, to forecast and update the OD matrix. In this study, based on the concept of the conventional 4-step transportation model and statistical approaches using observed traffic counts and zonal demographic characteristics, a combined trip generation, trip distribution and trip assignment model is proposed, which makes integrated use of Conditional Demand Analysis (CDA) and Traffic Assignment (TA) techniques. Three research designs are developed to test the validity and efficiency of the proposed algorithm.

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Cointegration Analysis of Transportation Data

Peg Young, Gary Feuerberg, Ken Notis
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The Bureau of Transportation Statistics, an agency within the Research and Innovative Technology Administration of the U.S. Department of Transportation, publishes the Transportation Services Indexes (TSI), a set of three monthly output indexes of U.S. transportation services for-hire (passenger, freight and total). Domestic modal data, for both freight and passenger travel, are indexed and aggregated monthly to create the TSI, which has tracked the service activity for the past 16 years. This indexing process, however, does not investigate the relationships between the individual time series that comprise the TSI. This presentation provides results of research that explores these time series relationships. Based upon economic growth, modal competition, and oil price-related effects, we have hypothesized several relationships that may exist between the time series data, and we use cointegration techniques to test these hypotheses.

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