ABSTRACTS

June 18, Monday 8:10 - 9:10----Room: Willow (ACME)

KEYNOTE SPEECH 1
Decision Making
Chair: Alan L. Porter, General Chair, ISF 2001 (ISyE, Georgia Tech, USA)

Do Predictions Improve Decision-Making?

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Do predictions improve decision making? In the area of environmental policy (e.g., climate change, acid rain, natural hazards), billions of dollars are spent each year on predictive research in the expectation that effective policies depend on accurate predictions. This expectation is commonly frustrated. For one thing, the capacity of predictions to contribute to good policy decisions depends on factors that are extrinsic to the research process. For another, the results of predictive research may be strongly influenced by the political context in which the predictions are generated. On the whole, the accuracy of a prediction is not obviously connected to its utility in contributing to good decisions. Lack of knowledge about the relation between predictive research and political context can render predictions useless and may in fact undermine policy goals. The value of predictions for improving policy decisions seems most strongly to be determined by a) effective communication between decision makers and those making the prediction, and b) the ability of decision makers to gain experience using the predictions. It turns out that neither of these conditions is easy to fulfill.

Daniel Sarewitz is managing director of Columbia University's Center for Science, Policy, and Outcomes. A geologist by training, he has been working at the interface between science and politics for more than a decade. His recent published work includes Prediction: Science,Decision Making, and the Future of Nature (Island Press, 2000).

June 18, Monday 9:25 - 10:25----Room: Willow (ACME)

Business Forecasts
Chair: Danny F. E. Carter (Lockheed Martin Aircraft & Logistics Centers, SC)

Forecasting Using An ERP System: Hints For A Successful Implementation & Beyond

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Tennant Company began using SAP R3 software in 1996 to forecast customer demand for its Floor Coatings products. Since then, the software has been upgraded three times and two additional implementations have expanded the use of the system to include Aftermarket forecasting of its industrial products world-wide and, since January 2001, the forecasting of its commercial Aftermarket products. Currently forecasts for approximately 35,000 Aftermarket parts and 300

Floor Coatings parts are updated monthly for 12 months ahead with better than average accuracy. Despite the upgrades as stated above and additional implementations, forecasts have been generated each month with only one exception due to problems with the software. This presentation will suggest ways to have the most successful implementation(s), upgrades and on-going forecasts as your business changes-- from one who has been there. Specifically, setting up the best forecasting process using an ERP system and handling on-going changes while forecasting monthly will be discussed.

The Utility Of Non-Parametric Techniques In Applied Business Forecasting

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This presentation will discuss the role of Non-Linear Exploratory Data Analytic or NLEDA techniques in forecasting short annual time series of 9-15 data points. NLEDA techniques make it easier to understand the forecasting model and help to alleviate the Black-Box Syndrome. These techniques also have an edge over traditional forecasting methods (ARIMA and exponential smoothing) particularly where there is a limited amount of data and when the data contain some unusual values. A hospital-based service line scenario (Obstetrics) will be used to demonstrate the application of NLEDA techniques in applied business forecasting. A detailed discussion will be held in the use of non-linear robust data smoothing and non-linear resistant-line fitting in forecasting short annual time series. This discussion will also incorporate the adjustment of forecasted values in order to align them with the market trends. The problem of construction of accurate prediction intervals for the forecasted values will also be addressed. The NLEDA techniques are an addition to the tool chest of applied forecasters but they are not a panacea for all applied forecasting problems and their limitations will also be discussed. Finally, due to their computational ease, the advantage of NLEDA methods, over the traditional methods, will be emphasized in gaining acceptance of the forecasts by executives for planning and decision making.

Beyond The Forecast

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As more and more aircraft fleets are extended to unprecedented years of service, the challenges faced by the support network have reached overwhelming levels. Time series forecasting is constrained by accurate data collection while parts support is capped by funding and limited by out of production replacements. In 2000 Lockheed Martin Logistics Services developed an integrated data base tool to assist aircraft parts managers to sequence consumption and supplier delivery to minimize inventory investment and optimizing support based on funding limitations. This technique has laid a foundation for inventory reductions of more than 40% and a reduction in necessary funds by nearly 30%. This Forecast Pro interface was built using Microsoft Access and is currently handling 11,000 parts while delivering managers parts status reports for parts exceeding planned levels by user prescribed limits. The integration of this simple tool helps to answer the questions: what to buy, how much to by, when to buy it, and how are we doing.

June 18, Monday 9:25-10:25 -- --Room: Peach (ACME)

Market Response
Chair: Len Parsons (Georgia Tech, USA)

Market Response Modeling In Far-Away Places

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Over the past decade, CPG companies have frequently used their vast resources of scanner data to build sophisticated time-series based models for quasntifying marketing effects from advertising, promotions and pricing. While supermarket scanners are one domain from which the Coca-Cola Company gets marketing information, the fact remains that less than 20% of it's worldwide business can be measured through this medium. The challenge therefore was to develop a system which could model marketing effects utlizing traditional store audit data.
Coca-Cola has developed such a system. Utilizing a methodology known as Multiplicative Competitive Interaction model, or MCI, this approach has been applied to outlet level audit data in such far away places as Peru, Kenya and the Philippines. In this presentation, the particulars of this modeling approach and Coca-Cola's experience and plans in utilizing this technology for brand planning and forecasting throughout various parts of the world will be discussed.

Projecting Analyses Of CPG Syndicated Data Into The "Uncovered" Markets

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Syndicated data for CPG products is available from Nielsen and IRI for about 50 markets, and 150 or so major key accounts. Analyses of response to advertising, couponing, and trade promotion generally show significant differences across market and key accounts. While they are big markets and big accounts, they still cover only about 1/3 of total CPG activity. To fully manage the marketing activities on anything less than a national basis, the results of analyses of syndicated data need to be projected or "forecast" on to the uncovered markets and accounts.

June 18, Monday 9:25-10:25 -- --Room: 110 ECC

Banking

Chair: Albert E. DePrince, Jr. (Middle Tennessee State University, TN USA)

Forecasting Cash Flows Of Bank Branches By Neural Networks And The Evaluation Of Forecasting Accuracy Versus Some Traditional Forecasting Methods

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Cash flow management is important in many, particularly in cash intensive, industries including retail banking. One of the main problems in the cash flow management of retail banks is related to meeting the cash demand of customers in branches and in ATM machines without any interruption on one hand; and minimizing the idle cash resources that is hold as a security on the other hand at the same time. However, to be able to utilize the cash resources available in an efficient way, the cash management needs to have the knowledge of the future cash flows. The cash flow forecasting, as a sub-operational area of cash flow management, plays an important role in providing the information required by the bank management.

In retail banking, where an ordinary bank may have as many branches and ATMs as several thousands, the size of the cash flow forecasting problem is mainly quite large compared to many other forecasting areas. A slight increase in the forecasting accuracy may provide huge financial savings to the bank management. That is why, the forecasting method that provides high forecasting accuracy is particularly important for retail banks. Especially in recent years some new forecasting techniques (e.g. Neural Networks) proved quite well in many forecasting areas. We have evaluated and compared the performance of Neural Networks with some other traditional forecasting methods and attempted to determine the applicability of Neural Networks to cash flow forecasting in retail banking so as to utilize the forecasting method that provides the highest accuracy.

Predicting Bank Soundness In The Eastern Caribbean Currency Union

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The paper first makes an intuitive assessment of the performance of the banking system by evaluating indicators of bank soundness. The paper then seeks to evaluate the likely implications of macroeconomic changes on the banking system. The impact of factors such as external and domestic debt service, the balance of payments, interest rates, inflation, real sector prices and the outlook for major trading partners are examined. The paper uses a selection of macroeconomic factors and bank specific factors such as liquidity, earnings, capital, non-performing loans in a logit/probit framework to predict bank soundness. The model seeks to identify banks that are likely to experience liquidity or solvency problems, given the macroeconomic outlook, and the performance and management of individual banks.

Keywords: ECCU, banking sector, performance, macroeconomic factors, bank specific factors and bank soundness.

Forecasting The Valuation Of Large Bank Holding Companies

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This paper develops and estimates a model of the "market-to-book ratio" of large bank holding companies, controlled for the geographic location of the corporate headquarters. It uses balance sheet and income data from one quarter to forecast the market-to-book ratio in the next quarter. Aside from assessing the predictive ability of public information, the model serves two other purposes. It seeks to determine the extent to which publicly available balance sheet and income data can explain the market-to-book ratio, and by controlling for geographic location, the model seeks to determine what, if any, role does geographic location play in the share price valuation. The model will be estimated using cross sectional data for 225 large bank holding companies arranged in six geographic categories. The market-to-book ratio is assumed to be a function of (1) various factors that may affect the net value of the institution's assets and liabilities and (2) various factors that might affect the institution's franchise value. Once relevant variables are identified, their effect on the market-to-book ratio will be estimated. The model will be estimated using the balance sheet and income data from the fourth quarter of one year and the market-to-book ratio from the next year. Data have been assembled for the latest four years, which will allow for the use of pooled data, as well as estimation of each year separately. Shifts in the estimation results over the four-year period are likely, given the significant institutional changes initiated through the Interstate Banking and Branch Efficiency Act (1994) and the Financial modernization Act (1999). The estimation results can also shed light on the consequences of the institutional changes on the ability to forecast valuation based solely on public balance sheet and income information.

Keywords: market-to-book ratio, asset valuation

June 18, Monday 9:25-10:25 -- --Room: 211 ECC

Leading Indicators
Chair: Lars-Erik Öller (National Institute of Economic Research, Sweden)

A Seasonal Factor Model For A Leading Indicators Approach

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Leading indicators have been widely used in macroeconomic forecasting. They are particularly useful to anticipate a turning point when this is close to happen. However, in many occasions, we face some incompatibilities between the originally unadjusted monthly indicators and the normally seasonally adjusted macroeconomic aggregates. In this paper we formulate a seasonal factor model for several monthly leading indicators sharing a common trend. The model will be written in the state space form and will be estimated by maximum likelihood. Afterwards, we will use the "pooled" information of the common factors to anticipate the turning points of a deseasonalized macroeconomic aggregate of interest.

Is The 1990s US Expansion Similar To That Of The 1960s?

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Statistical similarities among the latest long expansion in the U.S. and some other past expansions, in particular that of the 1960s, are examined. Corresponding to the definition of statistical similarity, a test based on the covariance matrices of business cycle component variables for the different expansions is proposed. Among available tests, the test based on partial common principal component analysis is argued to be most appropriate. The test is applied to the components of both GDP and the composite coincident index. As a result, the 1990s expansion is concluded to be statistically similar to that of the 1960s. Using the same method we also examine the statistical similarities of whole cycles (defined on a peak-to-peak basis).

Key Words: Business Cycle; Statistical Similarity; Covariance Matrix Structure; Composite Index; Partial Common Principal Component Analysis

A Classifying Procedure For Signaling Turning Points

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A Hidden Markov Model (HMM) is used to classify an out of sample observation vector into either of two regimes. This leads to a procedure for making probability forecasts for changes of regimes in a time series, i.e. for turning points. Instead of maximizing a likelihood, the model is estimated with respect to known past regimes. This makes it possible to perform feature extraction and estimation

for different forecasting horizons. The inference aspect is emphasized by including a penalty for a wrong decision in the cost function. The method is tested by forecasting turning points in the Swedish and US economies, using leading data. Clear and early turning point signals are obtained, contrasting favorably with earlier HMM studies. Some theoretical arguments for this are given.

Keywords: Business Cycle, Feature Extraction, Hidden Markov Switching-Regime Model, Leading Indicator, Probability Forecast.

June 18, Monday 9:25-10:25 -- --Room: 109 ECC

Exponential Smoothing
Chair: Ralph Snyder (Monash University, Australia)

Parameter Estimation In Exponential Smoothing

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This paper looks at the problem of estimating parameters for the common exponential smoothing methods. The phenomenon known as pile-up, where there is a non-zero probability of estimating the parameter at a particular value (either 0 or 1), is known to occur when estimating the moving average parameter in an MA(1) model. (This is described in Harvey "Time Series Models" 1993.) This paper will show that a similar phenomenon affects simple exponential smoothing where the parameter is estimated by minimising the Mean Square Error (MSE). The paper will go on to show that it also affects Holt's method, damped Holt's method and additive Holt-Winters method and further that it is more prevalent as the methods get more complicated. The paper will seek to give guidance as to when estimating the parameters by minimizing the MSE can be expected to yield good estimates and when it is likely that it.

Stability Properties Of Exponential Smoothing Models

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Recently, exponential smoothing methods have been shown to provide point forecasts for a class of state space models. The state space models provide the framework for the calculation of prediction intervals, the likelihood and derivatives such as the AIC. In this paper, I investigate the stability of the proposed state space models and show that some of the multiplicative versions of exponential smoothing are inherently unstable. Instead, I propose that the additive versions should be used in conjunction with Box-Cox transformations to approximate the kinds of behavior the multiplicative models are intended to describe.

Bayesian Exponential Smoothing

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In this paper, a Bayesian version of the exponential smoothing method of forecasting is proposed. The approach is based on a state space model containing only a single source of error for each time interval. This model allows us to improve current practices with exponential smoothing by providing both point predictions and measures of the uncertainty surrounding them. We therefore propose a method for calculating prediction distributions via Monte Carlo composition. We evaluate the method with a Monte Carlo simulation study and then apply it to forecasting car part demand. The main advantage of the approach is that it produces exact, small sample prediction distributions. It also works very quickly on modern computing machines.

June 18, Monday 9:25-10:25 -- --Room: 112 ECC

ARIMA-X12
Chair: Catherine Hood (US Census Bureau, USA)

The Automatic Model Selection Procedure of X-12-ARIMA Version 0.3

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This talk will give an update on progress in the development of a new automatic model selection prototype, currently implemented in Version 0.3 of X-12-ARIMA. This procedure is based on the automatic model procedure contained in the TRAMO time series modeling program developed by Agostin Maraval and Victor Gomez. Differences between the automatic modeling procedure in X-12-ARIMA and the original procedure in TRAMO will be discussed, and results of running this procedure on a small set of retail sales series will be given, comparing these results to those derived from the TRAMO seasonal adjustment procedure.

Outlier Selection For Regarima Models

Kathleen M. McDonald-Johnson; Catherine C. Hood, US Census Bureau / ESMPD, Room 3110-4 / Washington, DC 20233-6250, USA, Tel: 301-457-8425, Fax: 301-457-2304, kmcdonal@info.census.gov

We will look at various ways to select outliers to be included in regARIMA models (regression models with ARIMA noise). We will look at some automatic outlier identification methods and how the methods perform when we raise or lower the critical value. We will also look at the effectiveness of graphical outlier selection. We will use a large sample of economic time series from the US Census Bureau, in some cases adding one month of data at a time to simulate production.

Comparing The Automatic ARIMA Model Selection Procedures Of TRAMO And X-12-ARIMA 0.3

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The Census Bureau has enhanced the X-12-ARIMA seasonal adjustment program by incorporating an improved automatic ARIMA model selection procedure. The new procedure is based on the automatic model selection procedure of TRAMO, an ARIMA modeling package developed by Victor Gomez and Agustin Maravall. X-12-ARIMA's procedure differs from TRAMO's in a number of ways, related mainly to parameter and likelihood calculation and to outlier identification. We present the results of a study in which we applied the two procedures to a large set of Census Bureau time

series to determine how often both approaches chose the same or similar models. When distinctly different models were chosen, we compared goodness-of-fit diagnostics and forecast performance between the two models.

June 18, Monday, 9:25-10:25 -- --Room: 208 ECC

Technology Forecasting -1
Chair: Alan L. Porter, General Chair
(Georgia Tech, USA)

Forecasting The Future Of Forecasting Through Assumptions Held By Forecasters

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This study demonstrates that it is the questioning of the purpose, motivation and assumptions of the forecasters and futurists that would provide an explanation of the future of forecasting rather than looking at the way in which their techniques will develop. These techniques are already rich in both volume and variety, ranging from the hard end of the spectrum with modelling and predicting, right through to the softer end of the spectrum that involve the use of art and theatre, such as story telling and role playing scenarios. However, it is the purpose, motivation and assumptions of the forecasters and futurists themselves that determine what they are able to say about the future in the absence of a crystal ball.

Time can be considered as a continuum of experience in which events pass from the future through the present into the past. In this continuum, the future cannot be accessed, only anticipated and prepared for. Four assumptions concerning how the world works determine the way in which the future is considered: the past repeats itself, past trends continue, new trends and discontinuities are predictable, and the future cannot be predicted. The first two assumptions maintain that what happened in the past would be effected by the same events in the future and that prediction and forecasting can be a simple extension of the past or the past trend lines. Under these conditions of stability, heuristics developed through experience form the basis of the principles, policies and procedures that govern decision-making and action. On the other hand, the last two assumptions consider the future to represent a departure from the past, shifting the emphasis from prediction and the forecasting of a single future to a range of possible, although not necessarily probable, futures. Questioning the underlying assumption of predictions and forecasts cannot be underestimated because the decisions and actions taken today are based on how forecasters and futurists view the future.

The key issue facing forecasters and futurists therefore concerns the difficulty of validating the underlying assumption of their predictions and forecasts. Failure to deal with this difficulty means that the anticipated future never arrives while a different future always passes by. The first law of forecasting is that all forecasts are wrong. Winston Churchill acknowledged this law when he stated that "a young politician needs the ability to foretell what is going to happen tomorrow, next week, next month and next year. And to have the ability afterwards to explain why it didn't". This ability is of course hindsight, that is, the ability to learn from experience through reflection without which awareness declines. Schumpeter, in his study of entrepreneurship, observed that insight is the capacity of seeing things in a way which afterwards proves to be true, even though it cannot be established at the moment. This observation confirms the other fundamental law of forecasting, which is, foresight requires insight. These considerations imply that prediction, forecasting or futurology is more than backward or forward looking. It is about vision: a way of thinking and a way of doing.

Interdisciplinary Technology Foresight. A Quality Controlled Procedure

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Technology Assessment (TA) and Technology Foresight (TF) is well accepted as an interdisciplinary endeavor, since social, political, or ecological problems should be tackled by scientific research and generally do not concern an individual scientific discipline. Often interdisciplinarity has been 'down-scaled' to mere multidisciplinarity by simply taking contributions from several disciplines side by side without creating any cross connections. Instead interdisciplinarity should be upgraded to transdisciplinarity, i.e. defining the corresponding problem and solving it as a "real world"-problem independently from particular disciplines. TA and TF should use this problem orientated interdisciplinarity. It can be presupposed that within a scientific discipline several processes of quality control are well established (e.g. peer review processes). But the question arises, how should we establish a quality scale for interdisciplinary research? High quality of disciplinary inputs is definitely necessary and must be maintained. But the results of interdisciplinary cross linkage, of intense discussion between the relevant scientific disciplines must be scrutinized in an interdisciplinary manner as well.
In this contribution a procedure for TA by an interdisciplinary expert group is suggested consisting of a pre-project phase which has definitional character and the project phase. As typically for TA and TF, a "real world"-question concerning the future has to be answered at present. Due to the fact that the future is not foreseeable, it is not possible to find the "right answer". But it is possible to produce orientational knowledge based on rational considerations, which can be used to justify present decisions concerning the future. The procedure contains several evaluation loops, in which 'true' interdisciplinarity and transparency of the results are scrutinized. This type of TA is legitimized by quality controlled interdisciplinary knowledge and thereby optimized for both policy consulting and social learning processes.

On Temporal Displacement: Leveraging Technology Forecasting to Create Advantage

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Managers in technology intensive businesses tend to have a difficult time setting planning priorities. Among the several underlying causes are conflicting technology interests. On the one hand, such managers attempt to generate a constant flow of innovative ideas while, on the other hand, they attempt to control the longitudinal impacts of innovation in 'Time.'
Framing the problem as a multidimensional matrix allows managers to visualize decision attributes within the context of major impacts on the business's strategic intent. For the purposes of this presentation, we will limit those forces to three categories: 1), competition; 2), returns on committed resources (including but not necessarily limited to monetary constraints, manpower, competencies, and capabilities (absorptive capacity); and 3), technology (competency and value chain altering innovations). Based Upon the Management of Accelerated Technology Insertion (MATI) project 'Lessons Learned,' a pre-business case framework for visualizing a firm's investment in innovation will be proposed. The authors will show that creating a balanced innovation portfolio is a necessary first step in maximizing both the profitability and viability of the firm over the longer term. In aggregate, regardless of which specific approaches to technology forecasting and evaluation are implemented, the portfolio of projects must at least meet the unit's strategic goals (both quantitative and qualitative) and total returns, as outlined in the firm's portfolio objectives. In addition, the sum of all corporate strategy elements must, in aggregate, at least meet the firm's financial and non-financial objectives.
The proposed framework assumes that innovative companies use some variation of the portfolio approach to ensure that they maintain a balance between short-term, intermediate term, long-

term, and next-generation technology development. Such an entity must continuously deploy resources to simultaneously balance both the streams of contribution and the streams of longer term innovation. All that is required for success are effective value chains and a conscious portfolio of goals, risks, time horizons, and returns in each of the technology centers. Given that 'Time' is becoming an increasingly critical element in the portfolio, it is concluded that strategic opportunities in newly emerging market spaces can be created by streaming innovation and leveraging it to create temporal displacement in market and competitor spaces.

June 18, Monday 9:25 - 10:25----Room: 210 ECC

Sports Forecasting
Chair: J. Thomas Yokum (Angelo State University, USA)

Can Football Executives Predict Quarterback Performance?

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Previous sports forecasting studies have primarily focused on the efficiency of the betting market, i.e. whether there was sufficient systematic unutilized information that would enable bettors to beat the point spread. A second group of studies questioned whether there was systematic information that was useful in predicting the outcomes of sporting events. This paper examines whether the executives in the National Football League can predict the future performance of quarterbacks. If future performance can be predicted, quarterbacks who are selected earlier in the NFL draft should be more successful than those picked later. We test whether there is a positive relationship between (1) the order in which they were picked in a particular draft and (2) their subsequent performance. We use data from the NFL drafts of 1974-1995 and measure performance using the quarterback ratings.

Salaries, Performance, And Owners' Goals In Major League Baseball: A Glimpse Through Data

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This paper presents an exploratory examination of the relationships between player compensation, individual and team performance in Major League Baseball (MLB). From the player's perspective, Bases on Balls (BOB), Runs Batted In (RBI), and Home Runs (HR) appear to be the variables that are most highly correlated with compensation. Interestingly, the same measures of team performance also emerge as the best predictors of owner's interests, which were assumed to include team performance and the maximization of revenues. Owner's interests were examined in terms two basic criteria, namely, the number of games won and attendance, the latter being used as a proxy for revenues. The analysis as a whole shows that the objectives of the players and the owners are reasonably well aligned, a characteristic that is conducive to organizational balance and stability in the long run.

Forecasting Attendance For A Minor League Baseball Team Using Measures Of Promotional Effectiveness.

J. Thomas Yokum and Mark Pahl, Professor of Management Science and Graduate Student, College of Business, Angelo State University, San Angelo, Texas 76909, USA, Tel: 915 942-2383, Fax 915 942-2384, tyokum@angelo.edu

This paper investigates the forecasting and marketing performance for a small minor league baseball team (San Angelo, Texas Colts). Attendance is forecast for this season's (2001) games using a promotional model developed from the team's inaugural season of 2000. The results are compared to forecasts from a partial unobserved components model. Various promotional strategies compared for effectiveness are field contests, specialty acts, and TV advertising. Major and minor league promotion effectiveness are contrasted.

June 18, Monday 9:25 - 10:25----Room: 111/213

Tutorial: Exponential Smoothing
Chair: Charlie Hallahan (USDA-Economic Research Service, USA)

A Tutorial on Exponential Smoothing

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Exponential smoothing methods fall into the category of "simpler" forecasting techniques and, as shown in the various M-competitions, perform quite well when compared with more complicated models. This tutorial will discuss the various members of the exponential smoothing family that are suitable for data exhibiting different forms of trend and/or seasonality. In particular, we'll look at simple exponential smoothing and the Holt and Winters methods and use an examples several of the data series from the M3-competition. Conditions under which other forecasting models, such as those of Box-Jenkins, might be more appropriate will be discussed.

June 18, Monday 10:40 - 12:00----Room: Willow (ACME)

Spare Parts
Chair: Chair: Krish Srinivasan (Caterpillar, Inc., USA)

Demand Classification For Forecasting

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Classification of demand into discernable patterns is used extensively at Caterpillar, Inc. in determining the proper forecasting technique to predict parts usage. These classifications include trend, declining growth rate, seasonal, lumpy, and random. Applying appropriate forecasting techniques has proven successful for implementing the strategy to achieve inventory and customer service goals for both Caterpillar and its clients. Most classification procedures and techniques discussed in this paper have been developed internally to meet the challenging and diverse business demand patterns experienced by the clients for whom Caterpillar provides inventory management. Classification of demand is a challenge in many industries and, like others, Caterpillar is constantly improving its existing techniques.

Improved Forecasting And Supply Chain Management Driving Increased Sales - Case Studies

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Everyone wants improved customer service….but can you afford it…and does it buy a company measurable results on the bottom line? In this session, Caterpillar Logistics and clients in the automotive and service parts sectors will detail case studies demonstrating the impact of improved forecasting and supply chain management results.

Forecasting Demand For Service Parts - What We Know And What We Don't

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Customers perceive greater value in a product, be it an industrial machine or a home appliance, if service parts are readily available. When a company manufactures a variety of products and sells these products worldwide, precise forecasting of demand for service parts in different market regions is essential to ensure timely availability of service parts. This presentation will go into the kinds of service parts demand patterns different companies experience, some forecasting techniques that have been tried with success, and some of the challenges that are still ahead of us. Forecast accuracy and what it means in a service parts context, given a customer service and inventory turn objective, will also be discussed.

June 18, Monday 10:40 - 12:00----Room: Peach (ACME)

Sales Forecasting Benchmarks
Chair: Dr. Ken Kahn (University of Tennessee, USA)

Benchmarking Sales Forecasting Management

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The results of an extensive benchmarking research program on sales forecasting practices are reported, along with a framework for how managers can evaluate the sales forecasting process within their respective companies. This framework specifies sales forecasting to comprise the four process dimensions of functional integration, approach, systems, and performance measurement, with each of these dimensions having four levels of sophistication. Based on this framework, a protocol for how to conduct a sales forecasting process audit is given. Learnings from recent discussions and initiatives in the Sales Forecasting Management Forum at the University of Tennessee are then discussed to prescribe an ongoing research program for improving sales forecasting practice. Case examples are presented throughout the session to illustrate industry practices and those practices that can be described as better, if not best, practices for sales forecasting management.

Panelists:

Kenneth B. Kahn, Ph.D., The University of Tennessee

John T. Mentzer, Ph.D., The University of Tennessee

Mark A. Moon, Ph.D., The University of Tennessee

June 18, Monday 10:40 - 12:00----Room: 110 ECC

Interest Rates
Chair: Ronald L. Giles (South Bank University, UK)

Predicting International Interest Rates: A Leading Indicator Approach

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Leading indicators of inflation, which measure underlying inflationary pressures, are designed to predict cyclical upswings and downswings in the inflation cycle. Interest rates are also likely to rise and fall with inflationary pressures. This is because as inflation pressures increase, lenders who expect to be paid in inflation-eroded currency are likely to demand compensation in the form of higher interest, which is usually acceptable to borrowers who expect to pay in inflation-eroded currency. A composite index of leading inflation indicators, called a Future Inflation Gauge (FIG), can be constructed for the purpose of predicting inflation cycle turning points. Because the FIG is a measure of underlying inflationary pressures, it should also be able to predict cyclical turns in interest rates. The FIG has a short lead over inflation cycles, less than a year on average. Also, particularly in recent years, central banks like the Federal Reserve Board have acted to raise short-term interest rates whenever underlying inflation pressures have increased significantly. Thus, there should be a close correspondence between cyclical swings in the FIG and directional changes in short-term interest rates. In particular, it should be possible to devise a simple signaling system based on the FIG to predict cyclical swings in short-term interest rates. Such a plan was implemented for the U.S., U.K. and Germany. The results were in line with expectations, with the signaling system correctly predicting interest rate swings in all three countries over a period of several decades. In addition, it may be shown that there is a remarkably close relationship between the U.S. FIG and the Federal Funds rate over the past decade, a period during which the Federal Reserve is generally acknowledged to have had much success in its conduct of monetary policy. Over this period, the U.S. FIG consistently anticipated every directional change in the Federal Funds rate. One may therefore conclude that a leading indicator approach can be very useful in predicting international interest rates.

Is There Mean Reversion In Real Interest Rates? An Application Of Threshold Cointegration

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Perfect mean reversion in real interest rates implied by the Fisher hypothesis suggests the use of cointegration tests. However, traditional cointegration tests on the confirmation of the Fisher hypothesis yield mixed results. The failure of cointegration tests to find a stationary combination of

nominal interest rates and inflation may imply the need for a richer model specification rather than a rejection of the Fisher hypothesis. Threshold cointegration accounts for the possibility that the mean reversion is only active, conditional on certain threshold values in the observed variables. We explore possible threshold cointegration relationships between nominal short- and long-term interest rates with respect to inflation in the U.S., the UK, Germany and Japan. Finally, we investigate whether the findings of such effects can be exploited for interest rate prediction.

Structural Breaks And Long Memory In US Inflation Rates:Do They Matter For Forecasting?

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There is substantial evidence that several economic time series variables seem to experience occasional structural breaks. At the same time, for some of these variables there is evidence of long-memory properties. In particular, it seems that inflation rates have both features. One cause for this finding may be that the two features are difficult to distinguish. Indeed, various recent studies show that neglecting occasional breaks may lead to a spurious finding of long-memory properties. In this paper we focus on this issue within the context of out-of-sample forecasting. First, we show that indeed data with breaks can be viewed as long-memory data. Next, we compare time series models with structural breaks, models with long-memory and linear models for 23 monthly US inflation rates in terms of out-of-sample forecasting for various horizons. A key finding is that the linear models do not perform as well as the other two, and that the model with breaks and the model with long-memory perform about equally well. We also examine their joint performance by combining the forecasts. A by-product of our empirical analysis is that we can relate the value of the long-memory parameter with the number of detected breaks, in which case we find a strong positive relationship.

A Point And Figure Approach To US And UK Interest Rate Forecasting

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Both UK and US Interst Rate policy occupy pivotal positions in financial markets. However, competing fundamental positions are unclear with irreconcilable targets, a change and a poor forecasting record. Given such a large data base, this paper is able to consider an alternative forecasting approach, dipensing ith fundamental idealogy and basing itself on pattern recognitionand congestion.. The approach assumes that the data series can be interpreted as a memory pattern based on past performance enabling itto identify structural breaks. Hence only relevant time periods need be considered. The method is also able to identify breakouts of interest rate movements. Lastly targets are shown to be set in advance for future turning points. Hence the results become a leading indicator for competing fundamental models.

Keywords: Forward looking interest rate forecasting, technical trading systems.

June 18, Monday 10:40 - 12:00----Room: 211 ECC

Leading Indicators
Chair: David Bock (Göteborg University, Sweden)

The Use Of Cyclical Indicators For Policy-Making

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This paper focuses on the use of cyclical indicators for policy-making. On the methodological side, the study provides a schema for constructing composite cyclical indicators on a sound statistical basis through iterative steps, combining the use of traditional NBER methods with that of more recent techniques of cyclical analysis. NBER-type composite indicators are then compared with indicators obtained through a dynamic principal components analysis. Finally, we use an NBER-type composite leading indicator to obtain medium-term forecasts of GDP. The methodology is applied to comprehensive data of the Italian economy over the last twenty-five years.

Cyclical Indicators For The Euro Area: Real Time Estimates Of Turning Points Probabilities

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This paper deals with the business cycle of the euro area and of its major economies. Its aim is to implement econometric tools aimed at identifying the current state of the business cycle (expansion or recession) and to forecast cyclical turning points (peaks and troughs). Our analysis is based on a Hidden Markov Model, similar to that recently proposed by Gregoir and Lenglart (1998, 2000), which assumes that the series analyzed are driven by a common qualitative variable, following a Markov process. This variable can take on 2 values, corresponding to recessive and to expansive states of the economy. Information carried by the observed variables is exploited to estimate the probability that the common factor is taking on one or the other possible values, and, hence, that the economy is or is not in recession. Models of this kind provide analysts with a systematic frame to optimize information extraction from an array of high frequency series, usually derived from business and household surveys. The choice of the variables entering the model, however, is not usually based on an explicit and statistically grounded criterion. In contrast, our work is embedded in a preliminary analysis based on Forni, Hallin, Lippi, Reichlin (2000)^Òs Generalized Dynamic Factor Model, which has been developed at the Bank of Italy^Òs Research Department. This preliminary analysis - which exploits a panel of 800 monthly variables observed in the 6 major euro area economies over 15 years ^Ö provides a criterion to select our variables of interest according to their degree of commonality and to their leading behavior. Our approach allows us to measure sensitivity of model^Òs outcome to different selection criteria. We construct both national and area-wide indicators.

Deriving Unbiased Thresholds To Signal Turning Points In Leading Indicators - An Application To G7 Consumer Confidence Indicators

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The paper presents a new way of getting earlier information on approved leading indicators. Collecting new data series is expensive and time-consuming. Therefore the future of forecasting lies in the better usage of established leading indicators. The proposed method will help to answer questions of the type: How should a given value of e.g. the consumer confidence index be interpreted? When is it appropriate to read an actual value as a signal for boom or recession? How sustainable is the actual economic situation represented by a given leading indicator? Using the well-known Markov Switching Model (developed by Hamilton 1989) parametric estimates are gained, which can be interpreted as thresholds indicating boom and recession phases in a given

indicator. It is shown that crossing these thresholds is a sign for non-sustainable development and therefore signals a turning point in the underlying indicator. Monitoring of the business situation in the sense of Klein and Moore (1985) will be facilitated by this additional information and the interpretation of important economic indicators becomes more impartial. The proposed method is demonstrated using the widely used G7 consumer confidence indicators. It can easily be applied to other indicators.

Likelihood Based Methods for Turning Point Detection in Business Cycles - A Comparative Study

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On-line monitoring in economics with the aim of forecasting the next turn in the business cycle has always drawn much attention. Methods based on likelihood have optimal statistical properties and have recently been in focus. The methods are often expressed in terms of Bayesian analysis of hidden Markov models. Different ways to specify the likelihood-based monitoring systems are discussed. Two such methods are compared in detail and the effects of different specifications are examined. A simulation study is made to evaluate and compare the effect of the different methods for parameter estimation, smoothing and the choice of periods (for estimation and monitoring, respectively). One of the methods is non-parametric. Also, the effect of and information about the nature (a trough or a peak) of the next turn is examined. The methods are made comparable by a fixed median time to the first false alarm. Results are given on the median delay time to a correct alarm and the probability of detection of a turning point within two quarters.

June 18, Monday 10:40 - 12:00----Room: 109 ECC

Auto-Regressive Models
Chair: Lance Brannman (Maple Valley, WA)

Real Time Forecasting With Vector Autoregressions: Spurious Drift, Structural Change And Intercept-Correction

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A recent literature, dominated by David Hendry and Michael Clements, has emerged which emphasises the importance of the estimated constant term in Vector Autoregressive (VAR) forecasting models using nonstationary time series. A part of this research agenda has resulted in the resurrection of intercept-corrections, once popular with the large econometrics models of the 1970s, in the VAR context owing to the common occurrence of intermittent structural breaks and the importance of the constant term in determining medium and longer-term forecasting trajectories. This procedure is further developed in this paper and a new Bayesian estimator is proposed. It is shown that, in many commonly occurring situations, the proposed estimator produces a substantial gain in mean-squared forecast error over the alternatives of not intercept-correcting, or always correcting in the classical fashion.

Benchmarks For Vector Autoregressions

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It is well known that different software packages can provide different answers to the same problem, and vector autoregression (VAR) procedures are no exception. This paper produces benchmarks for VAR procedures, including coefficients and standard errors of the model, impulse response functions, and variance decompositions. Two examples from published work demonstrate the need for VAR benchmarks.

Forecasting Commodity Prices Using Random Walk and VAR Motheds: Empirical Evidence from the Pecan Market

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Price series of pecans are found to follow a random walk using the Box-Jenkins procedure. Bayesian vector autoregressions (BVAR), restricted victor autoregressions (RVAR), and error correction models (ECM) based on cointegration relationship are developed along with the random walk model to forecast pecan prices. Forecast performance evaluations are based on root mean squared error, and Cumby-Modest market timing test. In terms of RMSE, the random walk model outperforms all three multivariate models while the ECM outperforms the other two VAR models. None of the models has market timing value. The implication of the findings is that complex time series models may not necessarily provide more accurate forecasts than naïve model when price series follow a random walk. The findings are consistent with those of Meese et al. (1983) and Kim et al. (1995) using financial data.

Forecast Densities From Smooth Transition Autoregressive Models: Exact And Conditional Maximum Likelihood Estimation

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This paper considers the properties of forecast densities generated from a logistic smooth transition autoregressive (STAR) model. Data are generated from a known logistic STAR model. Parameter estimates are computed using conditional and exact maximum likelihood estimation. Sampling uncertainty is accounted for numerically, by repeated sampling with replacement from the estimator sampling distribution. Given the parameter estimates, Monte Carlo and Bootstrap procedures are used to generate forecasts and, correspondingly, forecast densities. Properties of the forecast densities generated under conditional maximum likelihood estimation are compared with those generated under exact maximum likelihood estimation.

June 18, Monday 10:40 - 12:00----Room: 112 ECC

Environmental-1

Chair: Edward S. Bender (Office of Science Policy (8103R), Office of Research and Development (ORD), US)

Analyzing Complex Threats For Operations And Readiness (Actor)

Mr. Steve Siegel and Dr. Sean O'Brien, Research Analysis Division, Center for Army Analysis, 6001 Goethals Rd., Fort Belvoir, VA 22060, USA, Tel: 703-806-5289, Fax: 703-806-5732, siegels@caa.army.mil

Underscored in the Army Chief of Staff's deployment goals is the concept of strategic responsiveness. The ability to achieve these goals may require prepositioning equipment and other assets in areas around the globe near where Army forces will most likely be deployed. Increasingly, over the past 10 years, the Army has been deployed for missions other than major warfare. Problems such as famine, civil war and other forms of instability have resulted in the Army performing small-scale contingency missions, such as humanitarian assistance (e.g., Support Hope in Rwanda, 1994). Determining where best to geographically preposition assets requires an assessment of the likelihood that particular countries will experience instability at some point in the future.

This study uses recently developed data-mining tools and draws upon an extensive historical database, which includes annually aggregated data covering political, economic, military conflict, and socio-cultural domains for some 157 countries, to forecast annual probabilities that these countries will experience instability over the FY 2001- 2015 period. It is recognized that environmental factors, such as deforestation and water scarcity, can be key contributors to country and regional instability. However, we were not able to directly model environmental factors in ACTOR because the data available did not meet the criteria for inclusion in the validation phase of the study; that is, to be modeled, environmental data needed to exist for a large number of countries over a long period of time. Nevertheless, we were able to integrate environmental data and analysis with the modeled forecasts (using existing environmental data and case studies), thus developing new, adjusted instability forecasts that account for environmental factors. This presentation will provide an overview of the ACTOR study, discuss how environmental factors were incorporated in the analysis, and highlight the need for improved environmental data in support of future Army analysis.

Petroleum Biotechnology: Future Research On The Year 2025

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All around the world, the petroleum industry will face stringent environmental regulations such as low sulfur and nitrogen emission standards. Moreover, this important industrial sector will affront challenges as the decreasing oil reserves, the fluctuating oil prices, and the increasing demand of petroleum, fuels and petrochemicals. These challenges will persist and strengthen in the following 25 years. In order to build a R&D strategy for the next 25 years, the IMP (Instituto Mexicano del Petróleo) undertook a large prospective study concerning the areas composing the oil sector (exploration & production, refining, transportation and petrochemistry). We identified current and future problems in the oil industry from the basis of an optimistic scenario and proposed several alternative technologies that might have an important
impact in the next 25 years. The prospective study showed that Biotechnology might influence the future developing of petrochemical and chemical industries.

Biotechnology has overcome a long-way since the 1950's and impact today different industrial sectors as food, pharmaceutics, medicine, agriculture, textile, etc. Because the good experiences of these industries, the petroleum industry interest today in biological processes as alternative technologies to resolve the challenges and needs of this worldwide important sector. We described

throughout this paper the importance of microbiological processes, biocatalysis and new technologies that might impact the industry, specially the petroleum and chemical industry. Moreover, we had identified several areas of opportunity in the oil industry where the R&D in Petroleum Biotechnology will play an important role during the next 25 years in order to surmount the decreasing oil stocks, the unstable markets, the environmental concerns and the industrial needs.

Economics, Politics, And Environmental Security: An Econometric Approach

Dr. Katherine S. Carson, Assistant Professor, Department of Economics and Geography, United States Air Force Academy, HQ USAFA/DFEG, 2354 Fairchild Drive, Suite 6K12, USAF Academy, CO 80840-6238, Tel: 719 333-2597, 719 333-7137 (FAX), Kate.Carson@usafa.af.mil

Numerous case studies describe incidents in which environmental conditions play a role in generating international conflicts. Economic research indicates that the level of environmental quality in a country is related to its level of development as measured by per capita income. Furthermore, there appear to be strong links between these two variables and the level of democracy in a nation. This study exploits the systematic differences among countries with respect to levels of turmoil, democracy, and environmental quality to examine the links between these variables in a cross-sectional framework. The study's goal is to uncover the relationships between political, economic, and environmental variables and to discover which variables may make a country or region more or less conflict-prone. Probit, logit and ordered probit and logit models of conflict are estimated using data from World Resources 1996-97. Forecasts of future conflict levels are then generated using data from World Resources 1998-99. The results indicate that an econometric approach can provide useful information about potential environmentally based conflicts. However, more detailed data and alternative model specifications should be considered to better capture the relationships between the variables generating environmental conflict.

Environmental Futures--Now Or Later

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Despite the interest and concern about future environmental problems, governmental organizations are uncertain about how to use information to anticipate these problems. The Environmental Protection Agency (EPA) has been examining techniques and conducting pilot foresight projects for nearly a decade. Recently, several EPA offices have begun collaborations to examine trends in drivers of societal change, to develop scenarios of potential future conditions, and to apply foresight and scanning techniques to particular issues of environmental concern. This paper focuses on efforts by the Office of Research and Development (ORD) to establish a foresight capability for the Agency and to identify potential issues for research, policies, and response strategies. Through its internal strategic plan, ORD has committed to develop foresight capabilities within the Agency. Foresight and scanning seem to be appropriate activities for a federal research program. However, offices charged with implementing EPA's regulatory activities are normally hesitant to use uncertain information to set priorities, allocate resources, and establish partnerships. Even within ORD, there are significant challenges, such as developing the necessary expertise, instituting a long-term commitment, and establishing criteria to evaluate the results. Another challenge for ORD is interpreting the results from futures analyses for managers and recommending policy changes. The ORD approach to building an environmental foresight capability involves both organizational and technical components. ORD's strategic plan gives notice to Agency and external researchers of the rationale for futures work and sets some basic expectations. Currently, three activities are ongoing within ORD: scanning, internal and external research projects, and a cross agency effort to identify specific issues as priorities. As it peers into the future, ORD faces many challenges. We look

forward to sharing experiences with symposium participants, and discussing the potential benefits to federal environmental research from the use of foresight methods.

June 18, Monday 10:40 - 12:00----Room: 209 ECC

Cycles
Chair: Hal Linstone (Portland State University, USA)

Cycles: Patterned Repetition Or Chaotic Behavior

Tessaleno Devezas and James Corredine, University of Beira Interior, Technological Forecasting Group, 6200-001, Covilhã - Portugal, Tel: 351-275320806, Fax: 351-275320820, vand@clix.pt

Research on long-term social and technoeconomic trends strongly suggests the existence in the social realm of invariant structures inside the complex flux of things we perceive. Among these invariant structures cycles in the evolutionary political and economic world system as suggested by Modelski deserve special attention, since they reflect significant systemic similarities and can provide information about the future for decision making. Recent research, however, on cycles modeling of these evolutionary processes point to a chaotic dynamics underlying their unfolding, suggesting that social systems are nonlinear thus making long-range forecasting impossible. Nevertheless, nonlinear systems with chaotic time-series do not exclude local predictions. If the attractors and the limit-cycles can be reconstructed, then techniques can be developed that allow prediction of short-run evolution with some accuracy. This paper aims to suggest two steps to be followed to handle social nonlinear systems. First, to distinguish true chaotic behavior from regular beats, separating the strictly cyclical behavior from chaotic time series. A regular beat in human affairs may be explained through two kinds of time-keepers: either an exogenous geophysical pacemaker as suggested by Berry, or the endogenous action of pure biological determinants as suggested by Devezas-Corredine. Second, to focus attention on the possible structural constraints driving the chaotic behavior, identifying the attractors and quantifying the limit-cycles corresponding to the given system. We want to suggest that the informational entropy production as related to the cohesion of the system might contain the hidden control parameter, considering that energy dissipation is the driving force for evolution.

Forecasting Democratization

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The world-wide spread of democracy experienced in the past century and a half may be understood as non-linear (learning) process of innovation-diffusion. A Fisher-Pry test of this proposition was first reported by Modelski and Perry in a 1989 paper on the basis of a data set that covered the period 1837-1986. It included the prediction that the flex-point of the process, when one half of the world's population would be living in democracies would be achieved by 2003. In the light of the spectacular advances in democratic practices in the last decade, a re-test of the innovation-diffusion thesis has now been performed with the same methodology but on a refined data set and with data up to and including the year 2000. It confirms that the flex-point will most likely have been attained by 2003 as predicted in 1989. It also reaffirms the earlier forecast that the 90- per cent saturation level for democracy would not be reached until early in the 21st century. The estimated time constant (the time elapsing between 10 and 90 percent saturation) of this learning process is 238 years.

Long Cycles: Digital Spectral Analysis

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Modern digital spectral analysis reveals that over the last 200 years, US inflation and economic growth have risen and fallen in cycles of 9-10, 18-19, 27-28 and 55-56 years: these cycles account for ~33 percent of the variance in what are otherwise very noisy series. There is mode-locking in economic downturns, with evidence of an 18.6-year pacemaker. The resulting macroeconomic phase periods map into a US political history marked by successive regime types (conservative, reformist, competitive, progressive) separated by catalytic or critical elections. Looking ahead, the Bush-Gore election highlights the competitive phase of politics that should last through the end of a slide into a long-wave trough ~2010, after which there should be an onset of progressively more inflationary growth occurring in an environment of progressive politics that should end in an inflationary spiral like that of 1980-1.

June 18, Monday 10:40 - 12:00----Room: 208 ECC

Technology Forecasting -2
Chair: Robert J. Watts (U.S. Army Tank-Automotive and Armaments Command, USA)

Identifying Trends In The Patent Literature

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Subsets of US patents are analyzed to show trends in the topics, categories and organizations for patented inventions. Methods for creating signatures for the textual fields of patents: Abstracts, Claims and Description, are used to transform patent literature into numeric vectors. The components of the vector are interpretable as key words or concepts that appear in some of the documents. These vectors are then analyzed as multivariate time series to identify trends in technologies that are being patented, and to identify which organizations are engaged in inventing particular types of technologies.

Assessing The Rate Of Change In The Enterprise Database System Market Over Time Using DEA

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This paper uses Data Envelopment Analysis, DEA, to measure the rate of incremental innovation in the enterprise database system market. Data was gathered from the Transaction Processing Performance Council consisting of 191 systems from 1995-2000 and the annual rate of change was determined to be 44.4%

The Proteus Project--Scenario-Based Planning Methodology For Advanced Concept Formulation

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PROTEUS is an advanced concepts futures research effort that seeks to pull out innovation drivers and new concepts by looking broadly and deeply across plausible alternative futures and developing an understanding of uncertainty in the future problem space. The analytical techniques underlying the research have come from two sources. The scenario-based planning technique

utilized was based on commercial best practices designed to manage uncertainty as developed by The Futures Group (now part of Deloitte Consulting). The technology planning technique is based on the former Futures Group's original work for the Federal Government in the late 1980's and early 1990's. Adhering to the principle of future "plausibility" versus "probability", four fundamental precepts have guided the research thus far: avoid uncritical extrapolation from today, avoid reductionism, challenge conventional thinking, and do not necessarily drive for early consensus. The project has evolved in two parts: (1) An examination of the future national security problem space using scenario-based planning and (2) The development of several approaches to the solution-space (what should the organization do about the problems uncovered). The discussion will touch on both aspects of the work (problems and transition to solutions). Framing a challenging and perhaps non-traditional problem space to explore possible outcomes, then engaging in planning-workshops set in those future operating environments, has given us a number of macro-level insights into future customer needs in general. The discipline of the methodology along with "team pioneering spirit" and leadership support is credited in the publication of the insights work, PROTEUS
Insights from 2020. These insights span all of the five worlds studied. They help the organization learn about the dynamic forces for change in these worlds and what they might mean for the future. In order to understand these new worlds, one must think about change in multiple dimensions across multiple venues - physical, virtual, biological, temporal. Thinking in new ways about the future operating environment along with an understanding of emerging future technologies helps research planners develop a solid basis for investments. Work in progress involves a deep probing into specific organizational implications of the future insights across a range of possible solutions. In part, those solutions will involve defining potential new systems and building alternative path technology networks to foster sound AR&D investments now in order to prepare for tomorrow's systems and technological applications.

Formulation And Analysis Of Time Slice Re-Composition (TSR)

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Ever-expanding information resources, a hallmark of the information age, have led to the development and application of bibliometric methods, which attempt to glean competitive and/or technological intelligence from large research and development (R&D) literature abstract databases. Exploiting technology information resources presents a great opportunity to enhance technology forecasting. Terms/phrases co-occurrence analyses across literature abstracts, related to any given subject, could provide an understanding of the principle components, factors, of the subject technology. However, such factor analyses can provide biased and/or misleading results without considerations for term/phrase usage changes over time. R&D terms' usage can change due to several factors; the maturing of the technology, technological leader new term usage, and influential sponsor program re-direction are but a few. By analyzing time-segmented files of R&D literature abstracts, principle components of the subject technology for each time period can be derived. Generally, the "language" of the technology does not change instantly, but evolves over time with significant overlap of the old and new terms. Key terms and/or phrases can, therefore, link the evolutionary factors (i.e., the principle components of the subject R&D documentation being analyzed). Time Slice Re-composition (TSR) represents an automated analysis process that derives, links and re-combines logically related factor grouping across time-segmented record files based upon key terms/phrases evolutionary usage patterns. TSR also extracts and documents the emergence of new terms and/or phrases over time and attempts to categorize them for forecasting purposes. The first applications of TSR on automotive technologies will be described and discussed.

June 18, Monday 10:40-12:00 -- --Room: 210 ECC

E-Business
Chair: Roger H. Bezdek (U.S. Department of the Treasury, USA)

Data Mining UNIX System Performance Data To Identify Predictor Variables For Use In Multivariate Regression Equations That Forecast CPU Consumption

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The enormous popularity and concomitant profitability of the rapidly evolving internet based business-to business (B2B) model is fundamentally altering the epistemological and methodological constructs relative to forecasting computer systems performance. The pervasiveness of the B2B market sector as the corporate tool of choice for conducting business transactions has triggered an explosion in the number, functionality and scope of corporate on-line application suites. These new productivity tools, in turn, have exponentially increased the volume of daily transactions that must be processed by client server computing environments. In order to manage the infrastructure growth associated with the B2B business model corporations typically construct several very large geographically dispersed data centers or central electronic complexes containing heterogeneous arrays of central and distributed computers. Further complicating this scenario, as well as potentially signaling the emergence of new capacity focused markets within the technology sector, are recent developments within the computer systems engineering field which suggest that the high costs associated with purchasing, maintaining, and scaling these disparate systems can be minimized by harnessing and using the unused computing power from numerous disconnected companies. Whatever systems engineering schema emerges as the preferred solution to support B2B business processes, corporations will need to effectively manage their substantial investment in computing resources and decision-makers will still need accurate forecasts of workload performance in order to either scale their infrastructure to accommodate new business growth and/or sell unused capacity. This paper describes the use of factor analysis as a data-mining tool to specifically identify major performance metering records that are statistically significant predictors of CPU consumption for UNIX servers.

New Challenges In Forecasting The Growth Of Internet Services Demand And The Network Capacity Requirements

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The forecasting of the Growth of Internet Services Demand and the correspondant Capacity requirements through traditional techniques, such as econometric modeling (different kind of Regression Models and Simultaneous Equation Models) or Time Series (Box & Jenkins, Exponential Smoothing, …), fail to accurately predict the future of this market. In fact, the past history of this market may not holds true for future state and performance since it fails to capture some new key drivers and changing factors. The alternative forecasting approach should take into account the impact of the rapidly changing within economic and social factors, new usages and proliferation of new technologies (MPLS, DWDM, ADSL, RSVP, 3G protocols) and applications (streaming video & radio, VoIP, Downloading MP3, Software, …).
In this paper, we intend to find out an adequate forecasting method based on some quantitative techniques (the S-Curve Analysis and New Product Penetration) and on the integration of the qualitative factors/drivers for the Internet Service Demand Forecasting. For this aim, we will identify and integer some
relevant new variables (technology, new usages,…) for each segment of customers. In the last part

of this paper, we will measure the forecast accuracy and ensure that the models are sufficiently flexible.

Emerging Opportunities And The Internet: Information Security

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Using encryption on the Internet is the equivalent of arranging an armoured car to deliver credit card information from someone living in a cardboard box to someone living on a park bench. Gene Spafford, computer security researcher, Purdue University. This quote serves to mock the current level of technical solutions applied to Internet based transactions. An armoured car is an inappropriate method of delivery if the recipient lives on a park bench and a cardboard box will not deter a determined thief! If the security of the transport is significantly stronger than the security of the end user system, the end user system becomes an obvious target for hackers; and crackers. This paper discusses how the Department of Justice, the CIA, NASA, the Department of Commerce and even Microsoft have publicly fallen victim to electronic sabotage due to the lack of security in their systems. In 1997, CERT (Computer Emergency Response Team) handled more than 39,000 reported incidents. That number is expected to have quadrupled by the end of 2001. The immense security risks of large networks such as the Internet are examined in full along with the security of firewalls linking private databases to the Internet. Because the Internet is considered to be in its embryonic stages, advancements in security should also be seen as such. With Trojan, virus & worm infections, becoming harder to detect and more catastrophic in the damage they cause, this paper also examines the new generation of malicious viruses, frequently delivered through email and why added security is imperative. To provide the required level of protection, security policies are needed which prevent unauthorized users from accessing resources on private databases, exporting private information and causing malicious damage.

Forecasting The Success Rates Of The U.S. Treasury Department's Basic Electronic Commerce Initiatives

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The advantages of electronic commerce are widely recognized, and aggressive efforts are under way in the public and private sectors to facilitate the transition from paper-based financial transactions to electronic financial systems. The U.S. Treasury Department is in the forefront of this change, and for the past five years has been serving as a major catalyst in fostering electronic commerce by converting Federal paper-based financial transactions to electronic funds transfer (EFT). However, there is a major problem in shifting Federal payments to electronic systems: As many as five million Federal payment recipients -- primarily low income persons, elderly retirees, immigrants, and minorities -- lack bank accounts and thus have no way to participate in the contemporary financial system or to conduct electronic commerce. To accommodate these persons and ensure that they have access to the benefits of electronic commerce, Treasury developed a low-cost, basic electronic bank account for Federal payment recipients called the Electronic Transfer Account (ETA). This was the first time in history that the Treasury Department undertook such a program, and the effort turned out to be complex, lengthy, and controversial. Forecasting the success rate of this initiative is especially difficult for several reasons: 1) the target population is distrustful of the government and financial institutions, and their acceptance of a new electronic product is difficult to predict, 2) no government program of this magnitude to change people's financial attitudes and behavior had ever been attempted, 3) there was little existing relevant empirical research available, and 4) even basic data on the demographics and socioeconomic characteristics of the target population were lacking. This paper describes the new initiatives and

innovative policies developed to address these problems and describes how the Department is forecasting the success rates of the EFT/ETA initiatives. The forecasting system developed is based on empirical data from pilot programs, Treasury contracted research studies, statistical sample surveys, focus groups, conjoint analyses, and success rates in related programs. It is emphasized that, because of the difficulty of changing the ingrained behavior of most of the target population, forecasting their response to incentives and initiatives has been very difficult, that forecasts for specific segments of the population differ dramatically in their feasibility and accuracy, and that responses to specific initiatives are difficult to predict. Treasury's ongoing research in this area is discussed and the requirements for further research in several areas are described.

PARALLEL PLENARIES-Special Sessions: Monday 1:15 - 2:15----Room: Willow

Advances In Regional Economic Forecasting
Chair: Kajal Lahiri (University at Albany, USA)

New York Economic And Tax Indices Based On Single Index Models

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There is currently no established framework for defining and analyzing business cycles at the sub-national level. Several studies on state level business cycles have been undertaken primarily by regional Federal Reserve Banks. However, no consensus has emerged on a common framework for analyzing regional business cycles. To fill the analytical vacuum, we apply the single-index factor methodology to analyze statewide economic fluctuations by developing coincident and leading indicators for the State of New York. An index measuring the revenue generating capacity of the state is developed, and the sensitivity of the index to overall economic conditions is examined.

Regional Employment Forecasts In Australia Based On Bayesian VAR Models

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We have developed leading indexes of employment for each of the Australian states, disaggregated by male/female and by full/part-time employment. The indexes are based on a conditional BVAR model, and use forecasts from our main Melbourne Institute macro model combined with several other indicator series. The index numbers relate the forecast employment growth 6 months ahead to the corresponding historical distribution. We show that the leading index does a good job of predicting regional employment growths.

Discussant: Rajeev Dhawan, Economic Forecasting Center, Georgia State University, Atlanta, GA 30303, Tel: 404 651 3291, rdhawan@gsu.edu, ecfrmd@langate.gsu.edu

PARALLEL PLENARIES-Special Sessions: Monday 1:15 - 2:15----Room: Peach

The Future Of Technology Forecasting: Multiple Perspectives
ASK ALAN

Panelists:

Hal Linstone, Portland State University; Editor of Technological Forecasting and Social Change

Joe Coates, President, Coates & Jarratt, Inc., foremost Futurist and Practitioner of technology forecasting
and assessment

Vary Coates, Director, Institute for Technology Assessment, formerly with the Congressional Office of
Technology Assessment

PARALLEL PLENARIES-Special Sessions: Monday 1:15 - 2:15----Room: 211 ECC

Environmental Forecasting

Organizer and Chair: Peter Rzeszotarski (Army Environmental Policy Institute, USA)

A Survey of Practitioners and Products
GET FROM WEBSITE

June 18, Monday 2:30 - 3:30----Room: Willow (ACME)

TRANSPORTATION
Chair: Peg Young (U.S. Department of Transportation, USA)

A Leading Indicators Index For Transportation Industries

Brian Sloboda, Bureau of Transportation Statistics, U.S. Department of Transportation, 400 Seventh St., SW (Room 3430), Washington, DC 20590, USA, brian.sloboda@bts.gov

Indices of leading indicators have been constructed to analyze the behavior of various macroeconomic variables and have also been developed to analyze changes for specific sectors of the economy. The development of the sector specific leading indicators allows for the analysis of repetitive sequences, to explain the meaning of these sequences, and to forecast on the basis of these repetitive sequences. The US Department of Transportation, Bureau of Transportation Statistics have developed transportation indicators, and from these data, DOT/BTS wants to analyze the behavior of the transportation indicators. The purpose of this paper is to develop a leading indicator for the transportation indicators and to test the effectiveness of this index as a tool for forecasting the different indicators in transportation.

Creating An Monthly Monitoring System For Transportation Indicators

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The Bureau of Transportation Statistics has created a monthly report, called Transportation Indicators, which reports on key measures related to the transportation enterprise. The co-authors of this paper have created a procedure to create monthly forecasts of these indicators, compare the new actual values of these measures to the one-step-ahead forecasts, and provide alerts for those measures that deviated more than expected every month. This presentation will discuss the procedures to remove interventions in the historical data, the methods employed to select appropriate forecast models for the individuals series, and the process used to apply statistical process control techniques in a timely fashion.

June 18, Monday 2:30 - 3:30----Room: Peach (ACME)

Inventory
Chair: Gary L. Shoesmith (Wake Forest University, Winston-Salem, NC, USA)

Development Of The Forecasting Models For Service Parts

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This paper deals with demand forecasting of parts for a product of which the model has been extinct. Parts are, usually, classified into three types with respect to the degree of dependence on the specific model, that is, standard part, partly dependent part, and fully dependent part. Standard part is used for all models of a product. A partly dependent part is used for several models and fully dependent part is used for a specific model. It is important to estimate how many inventories of a fully dependent part in the extinct model should be stocked because production lines of that part may be replaced by new ones while demand of the part still occurs. Furthermore, in some countries, there is a strong regulation that the product company should provide the parts of the old model with the customers for several years whenever they are requested. The major characteristic of parts demand forecasting is that the close correlation between the number of failures of a part and the demand of that part exists. For some products like TV, audio, the number of failure of a part is, in fact, equivalent to the demand. But, several factors as well as the failure of a part influence the demand of the part for products like automobile, vessel. These factors are the amount of safety inventories, replacement proportion of the failed parts by the used or repaired parts. The expected amount of failures in a part is basically determined by two factors, discard rate of the product and failure rate of a part. The total amount of failures in a part in a certain period can be obtained from the total amount of shipped products and the expected number of failed parts in that period. On the other way, it is very difficult to estimate the failure rate of the part and discard rate of the product because the available inter-failure time data is not complete. In this paper it is, therefore, to present two forecasting procedures for part demand. The first one is based on the assumption that it is possible to estimate all related parameters such as the failure rate of the part and discard rate of the product and replacement proportion of the failed parts by the used or repaired parts. The second one is based on the direct exploitation of part demand data when the available inter-failure time data is not enough to estimate all parameters. In this paper, some part data of H Motor Co. is used to illustrate our model.

The Relationship Between Forecasting Management And Logistics Performance: Results From A North American Study

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Forecast accuracy is the most prominent and generally accepted measure of forecasting performance. However, as noted by Schultz (1992), to determine if an organization is better off having implemented a new forecasting technique, "we must go beyond measures of accuracy and look to objective performance measures such as sales, costs, and profits" (p. 410). To do so, we must consider the attitudes and behaviors which influence the implementation of forecasts in practice.
This presentation will detail the results of a study which investigated the relationship between each of four proposed dimensions of forecasting management (Forecasting Functional Integration, Approach, Systems, and Performance Measurement), a Forecasting Management Performance construct, and a dependent variable measuring Logistics Performance. Results of the study confirmed a positive and significant relationship between the attitudes and behaviors associated with Forecasting Systems and the Forecasting
Management Performance construct, as well as a positive and significant relationship between Forecasting Management Performance and Logistics Performance.

Potential Inventory Cost Reductions Using Advanced Time-Series Forecasting Techniques

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This paper conducts demand forecasts for each of three product demand data series with short histories and compares their associated inventory costs. Three inventory management methods and the time-series forecasting techniques of vector autoregression (VAR) and Bayesian VAR (BVAR) are applied to each set of demand data. The results show that the BVAR technique, which uses mixed estimation, is particularly useful in reducing inventory costs in cases where the limited historical data offer little useful information for forecasting. The BVAR stochastic prior applied in the experiment is the standard Minnesota prior, which specifies a prior mean of 1 on the first own lag in each equation of the VAR, while the prior means for all other parameter estimates are zero, except the constant term which is unrestricted. This prior proved to be effective in improving forecast accuracy and reducing inventory costs in two of the three cases tested. In the third case, unrestricted VAR and exponential smoothing produced the lowest experimental forecast errors and computed inventory costs.

June 18, Monday 2:30 - 3:30----Room: 110 ECC

Volatility
Chair: Steve Beveridge (University of Alberta, Canada)

Regime Dependent Conditional Volatility In Financial Markets

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This paper develops the Regime Dependent Generalized Autoregressive Conditional Heterskedasticity (RD-GARCH) model and applies it to a daily index of returns on U.S. equities. The RD-GARCH model is different from previous models in that it combines Hentschel s (1995) single specification, which nests several of the more popular extensions to the GARCH model, with a general approach that allows model parameters to vary across periods of differing volatility. The out-of-sample forecasting performance of the RD-GARCH methodology is found to be superior to a number of alternative models. The sensitivity of forecast accuracy to the distributional assumption (normal, Student-t, generalized exponential) and to the length of model calibration period is also evaluated.

Forecasting Volatility

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We examine how well various time series models, including GARCH, EGARCH, the historical standard deviation, the historical mean absolute deviation, and several regression models, forecast future volatility on financial markets. Besides comparing the models forecasting ability, we seek to determine why some models out-forecast others focusing on four issues: 1) the relative weighting of recent versus older observations, 2) how much emphasis each model places on very large shocks, 3) the estimation criteria, and 4) the trade-off in terms of forecasting error between simple and more complex, models. The various models are compared in terms of their ability to forecast volatility in equity indices, interest rates, and foreign exchange rates and in five individual equity markets. We find that models based on absolute return deviations generally forecast better than equivalent models based on squared return deviations - though not for GARCH type models. We further find that models, like GARCH (1,1), in which the weights attached to older observations decline exponentially, tend to underweight the most recent and oldest observations and overweight those in between but that efforts to correct this using more flexible lag structures introduce additional estimation error which leads to poorer out-of-sample forecasting. Among the most popular time series models, we find that GARCH (1,1) generally yields better out-of-sample forecasts than the historical standard deviation but between GARCH and EGARCH there is no clear winner. However, all are dominated by a simple non-linear least squares model (developed here) based on historical absolute deviations.

The Value Of Additional Information When Forecasting Financial Volatility

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Dozens of time series models using the past history of volatility are available for forecasting volatility but not much work has been done on determining if other information can be brought into a model to improve forecast accuracy. This paper evaluates the usefulness of interest rates and yield curve information, trading statistics, cross-country volatility and returns, and other series for enhancing forecasts. It is found that short-run forecasts can be improved but gains are hard to come by in long-run forecasting.

June 18, Monday 2:30 - 3:30----Room: 211 ECC

Financial Forecasting
Chair: Nigel Meade (Imperial College Management School, London)

The Use And Usefulness Of Confidence Indicators: An Empirical Application To Forecast Short Term Real Gdp Growth In Selected Euro Area Countries

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The objective of this paper is to show that, in general, confidence indicators can be helpful in predicting economic activity in the short run. We first briefly review the main uses of confidence indicators, namely predicting turning points and making forecast. Subsequently, we build a short-term GDP forecast model for five euro area countries (Germany, France, Italy, the Netherlands and Belgium) using confidence indicators, namely the European Commission Industrial and Consumer Confidence Indicators, and the Economic Sentiment Indicator. In each country, the relation between real GDP and confidence indicators is supposed to vary over time and is estimated with the Kalman filter technique. All the estimated models have good in-sample properties. Regarding the out-of-sample properties, we compare the forecast performance of the estimated model with a GDP ARIMA model used as a benchmark. To complete the analysis, we implement the Diebold-Mariano test to check the accuracy of alternative forecast models.
We find that in general the models we estimate perform better than a simple ARIMA model. Moreover, as is common in the literature, the quality of the estimates differs among countries. In particular, better results are found for France and Belgium and slightly less satisfactory results for Germany, Italy and the Netherlands. These results still hold when the models are supplemented with a lagged dependent variable.

Keywords: Forecasting, Confidence Indicators, Kalman Filter JEL Classification: C22, E27

Medium-Term Forecasts Of Potential GDP And Inflation Using Age Structure Information

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Economic behavior as well as economic resources of individuals vary with age. Swedish time series show that the age structure contains information correlated to medium-term trends in growth and inflation. GDP gaps estimated by age structure regressions are closely related to conventional measures. Monetary policy is believed to affect inflation with a lag of one or two years. Projections of the population's age structure are comparatively reliable several years ahead and provide additional information to improve on 3-5 years-ahead forecasts of potential GDP and inflation.

A Comparison Of Density Forecasts Of Asset Returns In The Context Of Value At Risk

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The effectiveness of Value at Risk (VaR) as a risk management tool depends on the careful modelling of the stochastic behavior of asset returns. The density function used within the model is particularly important, since VaR concentrates on behavior in the tails of the return distribution. Using goodness of fit
criteria, a set of six density functions are compared with the normal density function as descriptions of the behaviour of returns on four equity indices. The comparison is carried out using both an unconditional and conditional models. Results indicate that the conditional model is preferable to the unconditional model and that several density functions are far better representations of observed behavior than the normal.

June 18, Monday 2:30 - 3:30----Room: 109 ECC

Neural Networks
Chair: Chrisopher Pineda Monterola (University of the Philippines, Philippines)

Forecasting The Kuala Lumpur Stock Exchange (KLSE) Composite Index Using Neural Networks

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Neural networks have been advocated as an alternative to traditional statistical forecasting methods. This paper involves the development and implementation of neural networks, the Multilayer Perceptron (MLP) to forecast the Kuala Lumpur Stock Exchange (KLSE) Composite Index. Single step time series prediction is employed for this purpose. The Composite Index data that is used in this study covers the period from 3rd January 1989 to 31st December 1992. The impact of numbers of hidden nodes on the performance of the MLP network model is assessed in this paper. A comparison between the MLP and random walk model is also done. Overall, the results from this study showed that the MLP network is applicable and could predict the KLSE Composite Index quite accurately. Besides that, the results also showed that the number of hidden nodes determines the viability of the model. Finally, the best MLP network in the study outperforms the random walk model.

Keywords: neural networks, Multilayer Perceptron, hidden nodes

Pitfalls In The Use Network Pruning Techniques

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The goal of this paper is to discuss the relationship among Weight-Elimination procedure, the initial application cycle, the final topology and generalization of a neural network prediction models in several areas of study. Keeping constant the initial parameters, we developed several tests using different setups. The performance of each models were very different, sometimes choosing a different set of independent variables. Important issues such as, the training process, generalization capacity and network structure were analyzed. Besides, it was considered one statistical method such as logistic regression, or Box & Jenkins to make a comparison analysis with neural network models that were chosen. Even so, the neural networks showed a better prediction performance when compared to the statistical methods. The approach used in the Weight-Elimination procedure in this work was slightly different from the proposed by Weigend (1991). The new algorithm introduces a limiar to each synaptic weight. During the training, each time the module of the weight become smaller than this limiar, it should be dynamically eliminated forced to zero. The remaining weights take on the residual, eliminating the last step of original procedure. In each problem, using the new algorithm, several models were tested, starting the pruning process at 1.000, 2.000, 3.000, 4.000, 5.000, 6.000, 7.000, 8.000, 9.000, 11.000, 13.000, 15.000, 20.000, 25.000 cycles, using an initial structure of 12x12x1. The final topology was 12x5x1, proving that this new algorithm achieved its
pruning objective. On the other hand, we observed that different initial cycles took us to different mean square error (MSE). Therefore, the conclusion is that outcomes are dependents the final network topology as well initial cycles and training. This fact is not taken in account in the original algorithm but has a great importance and should be observed during the modeling process.

Accurate Forecasting Of The Undecided Population In A Public Opinion Poll Using Neural Networks

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This paper addresses a problem encountered by pollsters which is to forecast accurately the final answers of the undecided respondents (UR's) to the primary question of a public opinion survey. The task is viewed as a pattern recognition problem of correlating the answers of the respondents to the peripheral questions in the survey with their primary answers. The underlying pattern is determined via a supervised artificial neural network (NN) that is trained using the peripheral answers of the decided respondents (DR's) to the peripheral questions in survey. With his peripheral answers as inputs, the trained NN outputs the most probable primary response of UR. For a poll conducted to determine the approval rating of the Philippine president, J. E. Estrada in December 1999 and March 2000, the NN approach predicted with a 95% success rate, the direct responses of a test population that consists of DR's who were excluded in the NN training set (75.43% of decided population). For the UR's (22.67% of December respondents; 23.67% of March respondents), the trained NN predicted a final response distribution that is consistent with the approval/disapproval ratio of the decided population. The use of neural networks in a public opinion survey offers distinct advantages over any statistical-based method such as: 1) Initial biases need not be assumed; 2) Probing of critical issues are straightforward; 3) Interdependence of relevant parameters can easily be incorporated; and 4) Neural networks are robust to noise.

June 18, Monday 2:30 - 3:30----Room: 112 ECC

Environment - 2
Chair: John Haslett (Trinity College, Ireland)

Forecasting California's Emerging Environmental Challenges

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In 1997, recognizing the value of foresight in environmental protection, the state of California's Environmental Protection Agency (Cal/EPA) established the Emerging Environmental Challenges Program to gather information on future environmental challenges faced by the state. The Office of Environmental Health Hazard Assessment (OEHHA), a department within Cal/EPA has spearheaded the effort. This program is designed to generate information that will enhance Cal/EPA's ability to take proactive measures to protect public health and environmental quality. The program identifies possible emerging environmental challenges by soliciting public input on trends in social, technological, economic, environmental, and political forces of change, and their potential impacts on environmental protection in California. In 1998, 1999, and 2000, OEHHA conducted four workshops around the state to solicit such ideas. Possible emerging environmental challenges identified to date have been screened and ranked, for the purpose of selecting those which appear to warrant further investigation. Some of the emerging environmental challenges that ranked the highest are: pharmaceuticals as environmental contaminants; potential environmental impacts of the increasing use of alternatives to traditional chemical pest control methods; the unintended environmental consequences of the release of genetically modified organisms; the environmental impacts of the introduction of invasive species; changes in risk management as a result of

advancements in risk assessments; changes in Cal/EPA's ability to regulate as a result of the globalization of trade; and the consequences of the massive increase of outdated electronic equipment.

Impact Of "Standard" Environmental Management Systems On Technology Forecasting

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Environmental management systems such as ISO 14000/ 14001 are having increasing impact on the decisions pertaining to management of technologies. Framing of these standards is still in evolutionary phase and their compliance is non-binding and voluntary, but the future of international trade, particularly in the context of proposed framework for WTO (World Trade Organization), is closely linked with the proposed enforced compliance of environmental standards. We explore in this paper the central question that how these environmental management standards can affect the analysis of technology forecasting? This core question raises a host of supplementary questions: What are the issues involved that would retain environmental standards as non-binding and voluntary for implementation or they could or could not be enforced as binding on international trade? Whether these standards are fixed or they are changeable and adaptive to the needs of the emerging technologies? Do these standards help in moving forward towards the path of sustainable development or they could also have adverse socio-economic impacts? On the one hand, we observe uncertainty in answering above mentioned supplementary questions. On the other hand, we empirically observe that the adherence to these standard environmental management systems is increasing worldwide at multiple scales of organizations. These conflicting trends have both the positive and negative impacts on using environmental management standards as one of the viable tools for
technology forecasting. We analyze these positive and negative impacts from multiple perspectives. We conclude that these standards can not only prove to be a useful tool for analysis of technology forecasting, rather at meta-level, usage of this tool can implicitly support the desirable linkage of sustainable development with the assessment and management of emerging technologies.

Predicting Past Climates

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For some decades quantitative procedures, often referred to as transfer functions methods, have been available to make palaeo-environmental reconstructions from different types of fossil assemblages including those of pollen, diatoms, chironomids etc. Such models are calibrated on modern data, involving a wide variety of environments at some thousands of sites across Europe. Current methods do not address many of the important spatial and temporal features of such calibration data, and the models are thus inadequate for exploring detailed research hypotheses. Fossil pollen data are available as counts of spores, for very many taxa, from radio-carbon dated slices at different depths in cores taken from lake sediments. Very many of the counts are small or zero. Our approach to the modeling of such data involves Bayesian hierarchical models. We envisage latent variables, smoothly varying in space and time, the values of which control aspects of the distribution of the observables. Counts are realizations of Poisson processes with mean values controlled by the latent variables. Observable aspects of climate, such as the mean temperatures of the warmest and coldest months, are Gaussian. All observables are conditionally independent, given the latent variables.
The solution methodology involves MCMC. The size of the data sets poses considerable technical challenges. The paper will report on some of these. From the point of view of more classical

forecasting, such methods may be of interest to those working with very disaggregated time series of highly multivariate count data.

June 18, Monday 2:30 - 3:30----Room: 209 ECC

Advanced Applications
Chair: Wilpen L. Gorr (Carnegie Mellon University, USA)

Using Software Agents To Predict Patterns Of Computer Crime

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The ability to predict computer crimes has become increasingly important. This paper describes a method for modeling the behavior of computer criminals using software agents. This method begins with an iterative clustering technique to identify base patterns of criminal behavior. We then convert the results of the clustering analysis into of model of criminal preference. Finally, the discovered preferences are used for the prediction of future attacks through the construction of software agents that embody the preference structure of the criminals.

Point Demand Forecasting For Network Optimization Models

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This paper provides geographic information system (GIS) methods and empirical models to forecast point demand for delivered goods. A point forecast consists of stops on a street network, including demand volume at each stop. We use several unique GIS algorithms and empirical models to generate the forecasts, including a model to correct for an under-sampling bias. The purpose of the forecast is to support a network optimization model, based on the traveling salesman problem, to locate one or more new distribution facilities in a region. We illustrate our approach with a case study of home-delivered meals (meals on wheels) in Allegheny County, Pennsylvania.

Leading Indicator Forecasts Of Crime Over A Uniform Spatial Grid

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We develop and validate leading indicator models for serious property and violent crimes for use in monthly police review and planning meetings. A geographic information system aggregates crime point data to monthly space/time series data for a uniform grid system approximately ten city blocks on a side. The leading indicators are reports of selected minor crimes and emergency 911 calls, lagged one month for the grid cell of interest and its contiguous neighbors. Extensive forecast experiments, based on Granger causality testing, show that it is possible to forecast approximately

40 to 50 percent of the large crime pattern changes that otherwise would have been total surprises.

June 18, Monday 2:30 - 3:30----Room: 208 ECC

Future of Forecasting
Chair: Alan L. Porter, General Chair, ISF 2001 (Georgia Tech, USA)

The Future of Forecasting - an ISF Working Group Session

Alan Porter will coordinate this effort to address the future of forecasting.

Jerry Glenn, director of the AC/UNU Millenium Project, will pose challenges to the forecasting community. This open session will then use a nominal group process to generate critical issues. For instance, these might (or might not) include:

* how better to train forecasters
* whether to press for research on forecasting methods
* ways to enhance the utilization of forecasts

We will then brainstorm actions that the forecasting community and IIF can take to resolve the most important of these issues. The aim is to enhance forecasting in the future. Proposed actions will be presented at a Tuesday mini-plenary session for further development and refinement.

June 18, Monday 2:30 - 3:30----Room: 210 ECC

Tourism/Telecm
Chair: Turgut Var, (Texas A&M University, USA)

The General-to-Specific Approach to Forecasting International Tourism Demand

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The main determinants of international tourism demand in South Korea are analyzed based on data for tourist arrivals from the four major tourism generating countries - Japan, USA, UK and Germany. The specific forecasting models for each of the origin countries are derived from a general autoregressive distributed lag model (ADLM) based on a rigorous statistical testing procedure known as the general-to-specific approach. The estimates of the demand models suggest that habit persistence measured by the lagged dependent variable is the most important determinant of demand for Korean tourism by residents from the four origin countries. Income, bilateral trade, and own and cross prices are also found to be important influencing factors in the Japan, UK and USA models, but the income and own price variables do not feature in the Germany model. Ex ante forecasts up to 2010 are generated from the selected specific models. These forecast results show that tourist arrivals from the four origin countries will continue to increase,

with Germany being the fastest growing country and Japan being the largest tourism generating country.

Keywords: International tourism demand, general-to-specific methodology, ex ante forecasting

Forecasting China Monthly Inbound Travel Demand

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Tourism is one of the fastest growing sectors in China. According to the World Tourism Organization (WTO), China was the 5th largest tourist destination and the top 8th tourist receipts earners in the world. Its average growth rate during the 1980-97 periods was 12% that is significantly higher than the world total (4.5%) and Asia's average rate (6.0%). To accommodate the high growth and for efficient planning and investment, accurate inbound travel demand forecasting is required. This paper compared the forecasting performance of a seasonal autoregressive integrated moving average (ARIMA) model, a basic structural model (BSM) and a "no-change" model. The models use monthly data within the context of forecasting inbound foreign visitor demand and total visitor demand. The empirical results shows that the basic structural model is better than seasonal ARIMA model to forecast foreign visitor demand. Overall finding indicates that the "no-change" model is the best for forecasting monthly foreign visitor demand in China. However, the performance of the "no change" model may depend on the nature of seasonal variation in the visitor arrivals time-series.

Key words: China tourism, seasonality, seasonal ARIMA, basic structural model and forecast comparison

Forecasting ADSL High-Speed Internet Service Subscribers in Korea

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The main objective of research is to forecast Korean ADSL service subscribers with Bass model. Unlike traditional forecasting approach, our new approach uses DOLS (Dynamic Ordinary Least Square) and FMOLS (Fully Modified OLS) instead of OLS method for estimating parameters in the first stage since OLS has down or upward bias in normal forecasting situations. We also provide clear evidence that there are some big differences between traditional method and our proposed method under several simulations. It is suggested to say that analyzing difference between traditional OLS estimation and new approach may have an implication for precise forecasting method using diffusion models. Furthermore, with respect to the analysis on ADSL service market before FTTH (Fiber-To-The-Home), this forecasting method and results can be useful for both local loop and future xDSL investment in Korea.

A Forecasting Model Of Tourist Arrivals From Major Markets To Thailand

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International tourism is a multibillion-dollar industry that is rapidly growing worldwide. With a growth rate of twice the world average in the last decade, East Asia and Pacific Region is expected

to be the focus of the world tourism industry With such growth and increased competition, it is important to forecast the potential of tourism in the region and understand the factors behind such growth. Thailand was chosen as the destination country with some major markets with distinct differences and characteristics. Past studies on demand have been based on econometrics or economic variables. Usually these methods lack a theoretical basis, or the assumptions made do not reflect tourism as a system. This study develops a model of tourism as a system based on the empirical evidence in the literature. The Tourist Flow Model was used to postulate the theoretical basis of the mathematical model. The study suggests that current research on tourism demand has been concentrated on a few countries, notably the U.S. and European countries, and consequently, the results are not reflective of would tourism demand. Different variables affecting tourism demand emerged from this study. The mathematical foundations of modeling with Multiple Regression are analyzed, leading to certain significant findings for improving the techniques and procedures. This study reveals the potential of standardized (beta) values as a potential alternative to demand elasticities for comparisons between two or more countries and two or more variables.

June 18, Monday 2:30 - 3:30----Room: 111/213

TUTORIAL: Seasonal Adjustment
Chair: Catherine Hood (US Census Bureau, USA)

Seasonal Adjustment Workshop

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The focus of the seasonal adjustment workshop is on the basics of seasonal adjustment. We will cover definitions of the components, the mechanics of seasonal adjustment in general, and various types of trend and seasonal filters. We will also discuss some issues in seasonal adjustment, including what makes an adjustment of high quality, finding extreme values in seasonal series, and the best way to adjust aggregate series (series composed of smaller series).

The workshop assumes no prior knowledge of time series or seasonal adjustment

June 19, Tuesday 8:10 - 9:10----Room: Willow (ACME)

KEYNOTE SPEECH 2:
Revenue Management
Chair: Russell Heikes, Program Chair, ISF 2001 (ISyE, Georgia Tech)

Revenue Management

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Revenue management is a discipline that focuses on maximizing enterprise revenue by efficiently matching capacity and demand. The field originated in the airline industry in the 1970s. It is credited with increasing revenues for major carriers by a factor of 5% to 7%. More recently, revenue management has been adopted by other enterprises both within and outside of the travel and transportation industries.

This presentation gives a brief introduction to airline revenue management and describes its application in the airfreight and truckload industries. The presentation gives particular attention to the use of decision technologies as enablers to the maximization of revenue and the efficient use of perishable capacity.

Mo Bazaraa: Managing Director for Global Logistics at The Logistics Institute at Georgia Tech. Bazaraa has over 25 years of experience in the areas of transportation, supply chain management, and information technology. His experience includes both academia and industry. As Professor of Industrial and Systems Engineering, he published three text books and many papers in the areas of optimization, networks, and logistics. He also served as Senior Vice President at Sabre with responsibility for the logistics business unit.

June 19, Tuesday 9:25 - 10:25----Room: Willow (ACME)

Selection and Evaluation
Chair: John C. Pickett (University of Arkansas at Little Rock, AR)

Forecasting Accuracy In A Collaborative Forecasting Environment

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We will explore the metrics and methods used to provide feedback and control on forecast performance. Forecasts are stored at each point in the collaborative process and accuracy is tracked at each step. There will be discussion on using multiple forecast origins and a variety of types of accuracy measures at different summarization and scales. Different metrics will be discussed based on the source of the data used to forecast. Forward looking metrics offer a tool to observe the effect of the latest monthly forecast compared to the prior forecast. Real life examples and Key Performance Measures (KPM) will be discussed.

The Necessary And Sufficient Conditions For An Efficient Time Series Model

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A forecast is found at the core of all proactive business decisions. Proactive business decisions reflect the uncertainty surrounding the future state of the market(s)in which businesses participate. Forecasts can be prepared using either a judgment offered by one or more individuals,

a statistical based forecast, or some combination of the two. If the forecasts are statistical, then the data used in the analysis may be either cross-sectional, time series, or both. Most business forecasts use time series data. The nature of the data drives the selection of the forecasting method. If the data is cross sectional, then classical regression techniques are the appropriate statistical technique. However, if the data is time series, then time series techniques must be used. Absent a few trivial forecasting problems, time series forecast prepared using regression techniques will include a larger forecasting error that forecasts prepared using time series techniques. Noting that all forecasts are applied, i.e., judgment or statistical techniques applied to data, the forecasting problem reduces to the search for the most efficient model. This paper focuses on identifying the criteria that can be used to identify the efficient model. The efficient model is the one that satisfies the necessary and sufficient conditions. This paper identifies the necessary and sufficient conditions, sets out the tests to verify that the conditions are met, and presents numerous examples.

June 19, Tuesday 9:25 - 10:25----Room: Peach (ACME)

Forecasting Systems - 1
Chair: Gary DeGregorio (Motorola Labs, Illinois, USA)

Integrating A Forecasting System Into A Productive Services Planning And Control System

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We present a new version of a software that is a simple but reliable tool to forecast demand for a company's products integrated in a Productive Services Planning and Control System. There are two main routines in this software: the first one, the forecasting module, suggests a forecasting model (if possible) for each product based on a time series approach, and generates forecasts for the planning horizon; the second one, takes into account those forecasts, as well as actual customer orders, actual inventory, transit stock, safety stock and economical order quantity, to suggest how much and when the product must be bought. The projected inventory for each period is also available. Those procedures are interactive: the number of future periods for which plans are made, the length of each period and the values of the forecasting models parameters are variables controlled by the forecaster. It is also possible to simulate various scenarios taking as the inputs other values for forecasted quantities and/or the quantity to order.

Theta Intelligent Forecasting Information System

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The need to effectively integrate decision making tasks together with knowledge representation and inference procedures has caused recent research efforts towards the integration of decision support systems with knowledge-based techniques. In the present paper we explore the potential benefits of such an integration in the area of statistical forecasting. The forecasting process is described and its main functional elements are identified. Some of these elements provide the requirements for an intelligent forecasting support system. The paper describes the architecture and the implementation of such a system (the Theta Intelligent Forecasting Information System, TIFIS), in which, besides the traditional components of a decision-support Information System

(input, processing, output, feedback) four constituents are included that try to model the expertise required: a Process Expert, a Learning Expert, a Data Expert and a Model Expert. The Information System adopts an object oriented approach to forecasting and exploits the forecasting engine of the Theta Model integrated with Judgment. The forecasting accuracy of the Information System is tested on the M3-Competition monthly data.

Forecasting Via A Set Of Dynamically Linked Roadmaps

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In many companies today, technology, capability, and product planning information is maintained in a haphazard collection of overhead slides, spreadsheets, and private databases by a set of disconnected "experts" and updated sporadically (usually just in time for the next review!). This information is often quite sparse and poorly supported by knowledge and supporting data, often being held only in the heads of the "experts." Therefore, it is often difficult to leverage this information as external technology and market forces continue to change. In an attempt to improve the forecasting / roadmap planning process and to provide the basis from which a company can develop its roadmap planning as a competitive asset, a set of methods, tools, and workshop-based training have been developed. These assist the technology strategists, systems engineers, marketing professionals, and product development managers in creating, leveraging, and maintaining an organization's critical knowledge as a dynamic linked set of strategic roadmaps, decisions, and requirements.
The three fundamental types of information/knowledge needed to support a best-in-class forecasting capability are: 1) the business, marketing and customer requirements driving your business; 2) the decision planning needed to frame the strategic direction of your company; and 3) the roadmaps (business scenarios) that identify the decision alternatives, criteria, and risk over time. Today, most companies are focusing on one or two of these essential ingredients, leaving a major gap in their ability to understand how change will impact their business in what is now an explosive period of technological and sociological change. They need to better leverage their strategic knowledge in order to dramatically improve their forecasting capability.
This approach fosters diversity of thought, and while the strategic direction of the enterprise can be clearly defined, minority and divergent forecasting views are also captured as part of the process to minimize groupthink and becoming blind sighted to disruptive changes. These inputs include minority, as well as partner, customer, supplier, industry trend, and competitive views.
This presentation will describe work that Motorola Labs is pioneering in providing an integrated, strategic decision-making, requirements management, and roadmapping process. To make this process realizable within a large enterprise, a set of methods and tools have been developed to support the process.

June 19, Tuesday 9:25 - 10:25----Room: 110 ECC

Risk/Volatility
Chair: Camilo Sarmiento (University of Georgia, Griffin, GA)

Time-Varying Risk Premia In Petroleum Futures Prices

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This paper uses an ARMAX-GARCH model to estimate the conditional expected returns of petroleum futures prices under time-varying risk. Empirical results suggest that explanatory variables previously shown to have forecast power in equity and bond markets as well as some commodity markets also have significant power in petroleum futures markets. Results are presented to show that conditional expected returns for petroleum futures prices can be quite large (10% to 20%). Results from a small forecasting experiment indicate that the out-of-sample forecasts from an ARMAX-GARCH model generally out perform a random walk at all forecast horizons.

Forecasting Exchange Rate Volatility In Emerging Countries Using Garch Model

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In the competitive business world, any factor caused the fluctuation of international trade is crucially important. One of the essential factors is volatility of foreign exchange rate. It has shaken the world when Asian countries, which are mostly emerging countries, faced the financial and currency turmoil in 1997. The crisis has spread out to others Western and industrialized countries as well. Since then, awareness of forecasting foreign exchange rate is rooted in most of government policy maker or economist's mind. In this study, the rate of return of exchange rate for RM/US, BATH/US, RAND/US are used to evaluate the performance of Generalized Autoregressive Conditioanl Heteroscedasticity (GARCH) models in forecasting volatility, to test the foreign market efficiency, to compare GARCH models with naive model such as random walk. The selected modified GARCH models applied in this study are Stationary GARCH (SG), Integrated GARCH (IG), Exponential GARCH (EG), GARCH in Mean (G-M), and Exponential GARCH in Mean (EG-M) models. The parameters of these models are estimated jointly using maximum likelihood method whereas the performance of within sample estimation is diagnosed using several goodness-of-fit statistics. From the result of significant parameter estimates, the constant variance model can be rejected. The one-step-ahead and out-of-sample volatility forecasting is calculated and statistically evaluated between the family of GARCH models and the Random Walk model. The result indicates that different currency has different model for forecasting. RM/US suggest SG(1,1), BATH/US with IG(1,1), and RAND/US indicates EG(1,1)-M is the best model respectively. Nevertheless, GARCH models family is clearly being proposed over the naive random walk model in forecasting the volatility of currency exchange rates for emerging countries.

Forecasting Performance From Modeling Risk Aversion

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Risk aversion in behavior is present in most intertemporal economic decisions. Risk aversion in particular might provide useful information in forecasting future marketing decisions. The analytical implications of ignoring risk aversion in forecasting is that past values of the variables entering linearly are given more than the ideal weight in the prediction model. Using a fed marketing equation for beef supply, this paper incorporates as a measure of risk aversion the variance and the skewness of the distribution of expectations on future prices. Short and long-term forecasts in a supply model that includes the variance and skewness from the distribution of expectations are then compared to forecasts yielded by the classical model that assumes risk neutrality.

June 19, Tuesday 9:25 - 10:25----Room: 211 ECC

Econ Methods
Chair: John B. Guerard, Jr. (The Conference Board, New York, NY, USA)

Out-Of-Sample Forecasting Performance: How Relevant Is It For Econometric Models Of Aggregate Economic Activity?

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Russell Chuderewicz, Florida International University

It is frequently suggested that an important factor for empirically validating an economic theory is the ability of an underlying econometric model to accurately forecast out-of-sample. This poses an interesting and empirically relevant question: if a simple time series model outperforms an econometric model in out-of-sample forecasting, should one abandon the underlying economic theory in favor of an `atheoretic' extrapolative model, even when the econometric model has better in-sample fit? Using data on aggregate economic activity, our analysis indicates that the answer to this question is (or should be) no. We provide empirical evidence, through a variety of time series and econometric models, that good in-sample fit and good out-of-sample forecasting performance can be incompatible without this invalidating the underlying economic theory. A small simulation study provides additional evidence in support of our main proposition.

Keywords: out-of-sample forecasting, in-sample fit, time series models, econometric models, simulation.

Socially Responsible Investment Screening: Strong Evidence Of No Significant Cost For Actively Managed Portfolios

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John B. Guerard, Jr., Chatham, NJ; Mustafa Gultekin, University of North Carolina, and Greg Adams, Brigham Young University

In this study, we create portfolios by using a composite equity valuation model incorporating high earnings-to-price, bookvalue-to-price, and analysts? revisions that have traditionally outperformed the market. We create socially screened portfolios by eliminating securities on the basis of alcohol, tobacco, and gambling; environmental; military; and nuclear power social guidelines. We find no significant reduction in portfolio outperformance of the equity index.

Forecasting And The Effectiveness Of The Leading Indicators

Victor Zarnowitz; John B. Guerard, Jr.; J.N. Chatham, The Conference Board, 845 Third Avenue, New York, NY 10022, USA, Tel: (212) 339-0432, Victor.Zarnowitz@conference-board.org

In this study, we examine the effectiveness of the leading indicators to forecast real GDP in the G7 nations, 1962-1998. We find that changes in the leading indicators can (statistically) significantly forecast changes in real GDP with a two-quarter lead. Relative forecasting accuracy is greater in the U.S. and Germany relative to the remaining G7 countries.

June 19, Tuesday 9:25 - 10:25----Room: 109 ECC

"Vertical Block'' Wavelet Data Shrinkage And Applications In Industry And Environmental Monitoring

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Wavelet shrinkage methods based on Stein-type shrinkage rule are powerful tools in regression problems involving multivariate data. We propose a shrinkage estimator that operates in the wavelet domain, which is developed from Bayesian and empirical Bayes ideas. In addition to being in agreement with some classical wavelet methods in multivariate regression (e.g.. ridge regression, penalized regression, block thresholding), this method is capable of incorporating some prior information about the signal of interest, such as smoothness, self-similarity, etc. The methods can be utilized in the context of discrimination, and data processing like smoothing, whitening, dimension reduction, generalized linear modeling, and outlier detection. We provide several real-life applications with discussion on benefits and ramifications of the introduced shrinking strategies.

Forecasting Using Recursive Partitioning Methods

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Predictive data mining is concerned with constructing statistical models from historical data. These models can be used to predict future or unknown data values, as well as to help gain insight into the data generating process. Recursive partitioning methods such as classification and regression trees, Multivariate Adaptive Regression Splines (MARS), and Multiple Additive Regression Trees (MART) prove very useful tools for function approximation and predictive data mining. This paper presents different recursive partitioning methods, relates them to other developed statistical models, and evaluates their predictive accuracy on both continuous and discrete response variables using various benchmark data sets.

June 19, Tuesday 9:25 - 10:25----Room: 112 ECC

Govt: Labor
Chair: Roy L. Pearson (Illinois Department of Employment Security, College of William and Mary, USA)

Forecasting Occupational Employment

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The U.S. Bureau of Labor Statistics (BLS) has responsibility for providing job seekers, educational planners, employment counselors and others with information on the future employment prospects for detailed occupations. As part of its work in this area BLS develops 10-year ahead forecasts for approximately 520 occupations and 11 education and training categories. This paper describes the models and procedures used to develop the forecasts; compares the BLS approach to others in the area; presents an overview of the most recent forecast results; and concludes with a discussion of potential improvements to the current forecasting system.

Forecasting Sectoral Employment At The Regional Level

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Forecasting sectoral employment at the state - level represents a new field of economic research activity in Austria. Regional policy makers are growingly interested in forecasting their constituencies' economic activity, with the emphasis being put also on structural information as well as the ability to evaluate regional performance compared to other states in Austria. This paper describes the ongoing research on generating forecasts for sectoral employment at the state level. The focus of this paper lies on the methodological approach which comprises a mix of different forecasting methods.
These range from time series models like ARIMA-type models - which include leading indicator variables and generally offer good forecasting properties - to more complex models that increasingly integrate structural information, making these forecasts more appealing to policy makers. Among the latter are structural Vector Autoregression Models that contain information from input-output tables. The paper also discusses how to deal with data problems associated with regional forecasts, especially in terms of scarcity and quality of data, structural breaks and different periodicity of the time series.

The Relative Accuracy Of Employers: Three-Month-Ahead Employment Forecasts Over 18 Quarters, 1995.4 Through 2000.1

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Short-term forecasts of future employment needs are an input for planning the level and type of workforce training to be provided as well as for assessing a states general outlook. One forecasting approach is forecasts obtained from state-conducted employer surveys. This paper assesses the accuracy of three-month-ahead employment forecasts from quarterly stratified random samples of State of Illinois establishments. The survey instrument and methodology were unchanged over the 18 quarters, yielding a
consistent set of information. The survey responses provide approximately 18,000 ex ante forecasts (mean survey response rate of nearly 50%) plus data on each establishment industry sector, current employment, and general business outlook. Employer forecast accuracy is analyzed in total and by industry for the forecasted employment percent changes, and then compared to the accuracy of naïve no-change forecasts and forecasts from a variety of time series methods. Direction of change, irrespective of size, also is widely used survey-obtained information. The information gain and relative information gain of these employers forecasts of direction of change also are assessed, following the approach of Henri Theil. This paper expands on prior preliminary work. More quarters of survey information and full population data for Illinois employment allow a broader and more statistically meaningful assessment of the relative accuracy of the survey-based forecasts.

Keywords: Accuracy, survey-based forecasting

June 19, Tuesday 9:25 - 10:25----Room: 209 ECC

Accuracy
Chair: Ray Nelson (Brigham Young University, Utah, USA)

New In-Sample Prediction Errors In Time Series With Applications

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The article introduces two new types of prediction errors in time series: the filtered prediction errors and the deletion prediction errors. These two prediction errors are obtained in the same sample used for estimation, but in such a way that they share some common properties with out of sample prediction errors. It is proved that the filtered prediction errors are uncorrelated, up to terms of very low magnitude order, with the in sample innovations, a property that share with the out-of-sample prediction errors. On the other hand, deletion prediction errors assume that the values to be predicted are unobserved, a property that they also share with out-of-sample prediction errors. It is shown that these prediction errors can be computed with parameters estimated by assuming innovative or additive outliers, respectively, at the points to be predicted. Then the prediction errors are obtained by running the procedure for all the points in the sample of data. Two applications of these new prediction errors are presented. The first is the estimation and comparison of the prediction mean squared errors of competing predictors. The second is the determination of the order of an ARMA model. In the two applications the proposed filtered prediction errors have some advantages over alternative existing methods.

Nonparametric multivariate conditional quantile prediction

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A nonparametric method is presented for simultaneously estimating the conditional quantile of a multivatriate response variable Y. When there is interdependence among the responses, more accurate conditional quantiles can be obtained by making use of the multivariate methodology than if we were to treat the responses separately. Computationally, the proposed method is more efficient in the sense that it requires a much less computer execution time than the corresponding univariate method. It is shown that when the objective is make multi-step ahead prediction from time series processes, the proposed method can be easily adapted to fit prediction problems. Applying the adapted method to predicting tail conditional quantiles from foreign exchange daily returns, it is observed that the accuracy of extreme tail conditional quantile predictions can be greatly improved by incorporating interdependence between the returns in a bivariate framework. This finding is interesting in finance because of its direct implication to down-side risk or value-at-risk (VaR)calculations.

The Information Content And Quality Of Wall Street Journal GDP Forecasts

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The Wall Street Journal semi-annually publishes forecasts by a panel of prominent business economists. The Wall Street Journal combines these forecasts into consensus predictions for GDP. This paper investigates the value of considering the distribution of forecasts rather than summary statistics. More

specifically the paper illustrates how violin plots augment traditional measures of central tendency, variation, skewness, and kurtosis as a valuable analysis tool. The paper also investigates whether forecasters consistently cluster into bearish and bullish regions of the forecast distribution. Finally, in the case when individual forecasters exhibit consistent bias, the paper questions whether such participants should be censored from the consensus.

June 19, Tuesday 9:25 - 10:25----Room: 208 ECC

Technology Forecasting - 3
Chair: Elaine Deschamps (Indiana University,WA, USA)

Technology Foresight And Policy Selection

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Technology foresight has received increasingly more attention from researchers and policy-makers. Although some developed countries has got some experiences from their foresight practices, however, there are still many issues to be discussed in the methodology selection and development, especially those suited for developing countries. Furthermore, policy approaches for shaping the trajectory of technology development are also diversified but very important. This study intends to discuss the experiences of technology foresight in developed countries and its impact on future practices of technology foresight in China. Also the study will discuss the policy approaches for shaping the trajectory of technology development in China.

Institutional Change and Forecast Accuracy: A Case Study of Budget Forecasting in Washington State

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This research examines the relationship between institutional change in government forecasting and forecast accuracy. A new agency was recently created in Washington State responsible for the production of statewide entitlement caseload forecasts that are used as the foundation for budget expenditure forecasts. This study applies a number of hypotheses developed in the government revenue forecasting literature to the expenditure side, such as:
Do more frequent forecast revisions improve accuracy? Is there any evidence of bias in expenditure forecasts, as has been shown in revenue forecasts? How does the establishment of a technical workgroup process aimed at information exchange and consensus formation affect both the legitimacy and the accuracy of the forecasts? How does the accuracy of forecasts produced through a workgroup process compare to the accuracy of a standard time series model? This paper presents results of an analysis of the impact of institutional change on forecast accuracy and bias in the caseload forecasts produced in Washington State between 1996 and 1999.

Technology Mapping For Management Of Technology - Automated Extraction And Visualization Of Information From Bibliographic Sources

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This paper reports on two partially automated processes to generate helpful knowledge from text very quickly and easily:

* "mapping" key information from large sets of abstracts on a topic of interest, and
* a graphical indicator that combines information from such a set of abstracts with external information.

These visual representations seek to support technology management. They enhance a knowledge discovery in databases (KDD) approach called "Technology Opportunities Analysis" (TOA).

June 19, Tuesday 9:25 - 10:25----Room: 210 ECC

Business Applications
Chair: Dr. Nicolas Dominguez (Mexican Petroleum Institute, Mexico)

Forecasting Meat Demand In Barbados

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This paper estimates statistical demand functions for meat using quarterly time-series data for Barbados. The paper uses a CBS demand model and multivariate cointegration techniques to estimate the income and price elasticities of these meats. In addition, given that Barbados has just moved to a tariff only regime with protection declining by approximately 24% over the next three years, these models are used to forecast meat demand in Barbados if the local price of these meats is allowed to decline to the import price of these commodities.

Forecasting Brazilian Imports: Which Is The Best Approach?

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Forecasting a country's foreign trade may be done in several different ways. Besides selecting the forecasting method to be used, one needs to make choices regarding whether to work with: (1) disaggregated or agggregate data; (2) data in price/quantum terms or in value terms; (3) seasonally adjusted or not seasonally adjusted data. There are obviously many possible combinations of these choices and it is not clear which provides the best forecasting approach. In this paper we present some empirical evidence on this issue for the case of Brazil. We apply various univariate and multivariate forecasting methods under every possible combination of choices (1)-(3) above to the problem of forecasting Brazilian monthly imports. We then evaluate each model's performance by using Theil's U, RAE and UAPE error measures.

25-Year R&D Prospective For The Mexican Petroleum Sector

Dr. Nicolas Dominguez; J. Aburto A., E. Aguilar R., J. Ancheyta J., M. Bauer, M. del C. Cabrera R., E. Diaz A., A. Diego O., G. Delgadillo R., A. Estrada M., J. Fernández L., A. Fragoso G., M. Gachuz M., M. Garrido S., L. Gómez D., G. González C., F. Guzmán, A.L. Hernández M., J. J. Hernández, J. Hernández V., C. Lira G., C. Mendoza M., M. Meza C., A. Montoya de la Fuente, A. A. Porres L., R. Quintero, N. Rojas A., D. Romo R., M. E. Ruiz S., W. Smith V., J. J. Solís G., F. Thomas V., L. Toledo P., A. Villalobos H., G. Yáñez R., R. Zárate R., Mexican Petroleum Institute, Eje Central Lazaro Cardenas No. 152, Mexico D.F. 07330, Tel: 011-525-333-6215, FAX: 011-525-333-6216, ndoming@imp.mx or ndoming@www.imp.mx

A methodology was developed to identify R&D areas of opportunity in which the Mexican Petroleum Institute (IMP) should become strategically involved in the next 25 years. The model consisted in part in developing macroeconomic scenarios and in a systematic analysis of the Technology Platforms of the Mexican Oil Industry. The methodology allowed identifying generic or emergent technology areas in which IMP should develop, adapt or adopt technologies in order to trigger innovation and competitiveness in the Mexican oil industry. Based on the identified technology opportunities, actions to develop
strengthen or maintain core competencies were outlined. This study is the first in its class carried out in Mexico for R&D in the oil sector. The methodology will allow updating the results in revisiting the work in the near future. The IMP upper management played a leadership role in the definition of the project. This prospective study was elaborated with the contribution and participation of high-level executives, mid-level managers, engineers, scientists, strategic planners, technologists and economists working in the Mexican oil sector, as well as decision makers from the Mexican government and professionals from the Mexican academy. The methodology and the results of the study will be discussed at the meeting.

June 19, Tuesday 9:25 - 10:25----Room: 111/213

Tutorial: Heirarchical Data
Chair: Eric A. Stellwagen (Business Forecast Systems, Inc., USA)

Forecasting hierarchical data

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This workshop will compare and contrast different strategies used to forecast a product or geographical hierarchies. Issues to be discussed include:

- Constructing the hierarchy
- Reconciliation: top-down vs. bottom out
- Capturing seasonal variation for short life cycle series
- Handling product line extensions and replacement products
- Current research

June 19, Tuesday 10:40 - 12:00----Room: Willow (ACME)

Financial Planning
Chair: Steve Beveridge (University of Alberta, Canada)

Employment Forecasting In The Automotive Industry

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Near-term and longer-term personnel management strategies at General Motors rely on accurate employment forecasts. GM's population (135,000 hourly and 50,000 salaried in the U.S.) and organizational complexity make forecasting employment out five years challenging. For the hourly population, the situation is made more complex by the constraints on attrition and employee movement specified in the union contract.
In this paper we compare and contrast the methods used to forecast demand and supply for salaried and hourly employees. While forecasts for both groups are grounded in the same product plans, we have found that they differ in significant ways on the supply side, for example, in their (a) definitions of classifications of employees, (b) rules governing employee movement from one location to another, the permissible rate of attrition in a location and the closing of locations, and (c) the cost implications of the forecasts. We also contrast the processes involved in forecasting employment demand for the two populations and the types of units for which forecasts are produced. Throughout the paper we discuss the uses of employment forecasts in GM. We conclude with a comparison of the mathematics involved in hourly and salaried forecasting at GM.

Structural Forecasts For Long-Range Utility Forecasting

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Otter Tail Power Company has been using a structural forecast for long-range forecasting for almost 20 years. The new utility structures and deregulation are suggesting that long-range forecasting will change or go away. The forecasts will have shorter time horizons and will be more statistical based. While this may be true, there are advantages to structural forecasting that will be difficult to replace. In a changing forecasting environment, structural forecasts are more flexible, require less historical data, provide useful analysis data and facilitate scenario planning. On the other hand, they are labor intensive, data intensive, and can be difficult to calibrate. Experiences in California demonstrate that the need for long-range forecasting will not go away and will continue to be required electric supply planning, substation planning and governmental reporting. This presentation gives a brief description of structural forecasts, discusses some of these issues, and details ongoing needs for supporting this function. It also compares and contrasts this kind of forecasting with more the traditional econometric forecasting approach that is the mainstay of utility long-range forecasting.

Keywords: structural forecasting, long-range forecasting, end-use forecasting, load shapes, utility forecasting, Electric demand forecasting, electric energy forecasting,regional forecasting

Forecasting Financial Volatility: What Works Best?

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Since the early 1980s the number of techniques proposed for forecasting volatility in stock and foreign exchange markets has grown rapidly. In most cases, though, the usefulness of the procedure is gauged by how well it fits the sample period relative to contenders with little or no evaluation of post-sample forecast accuracy. This paper focuses on the quality of volatility model forecasts. The first section provides a survey of studies that have assessed the predictive ability of some of the forecasting techniques. The best of those methods are carried into the second part of the analysis, which gauges the accuracy of more recent procedures to arrive at a conclusion of what techniques seem to be the most promising.

June 19, Tuesday 10:40 - 12:00----Room: Peach (ACME)

Game Theory
Chair: George Wright (Strathclyde University, UK)

Game Theory Wins Nobel Prizes, But Can It Win At Forecasting?

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Can game theory aid in forecasting the decision making of various parties in a conflict? A review of the literature revealed diverse opinions, but no empirical evidence on this question. Twenty-one game theorists made 86 forecasts of decisions for five diverse conflict situations. The same situations were described to students, with 267 of them making 184 forecasts using unaided judgement, and 823 students making 136 forecasts in active role-playing. Averaged across the five situations, 34% of the game theorists' forecasts, 20% of unaided forecasts, and 60% of role play forecasts were correct.

Keywords: conflict, expert opinion, forecasting, game theory, judgement, role-playing, simulation.

Panelists:

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June 19, Tuesday 10:40 - 12:00----Room: 110 ECC

Market Volatility
Chair: Claudio D. Antonini (Validea.com, Inc., Bloomfield, CT, USA)

Intertemporal Price, Volume and Volatility Interactions between DJIA Spot and Futures Markets

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In this study, we empirically examine the dynamic relationship between Dow Jones Industrial Average (DJIA) spot and futures markets by constructing a vector autoregressive (VAR) model. The volatility series in the VAR model are derived from the GARCH model estimations. We find evidence of two-way causality, but the impact of a one time increase in futures returns on the spot return volatility is found to be greater than the impact of a one time increase in spot returns on futures return volatility. Further, the results show that a one-time increase in spot trading activity decreases spot and futures return volatility. However, a similar increase in futures trading activity increases futures return volatility but has no net impact on the spot return volatility. Thus, the results are consistent with the view that an investor trading in the futures market needs to consider the return movements in both spot and futures markets and the volume movements only in futures market. On the other hand, an investor trading in the spot market needs to consider only the return movements both in the spot and futures markets. Based on the empirical results here one can say that the trader's perceptions are formed in the futures markets perhaps because of lower transactions costs, and fewer restrictions. Investors may use the futures market to discover the new equilibrium price, where the mean (therefore filtered) of this equilibrium price may be transmitted to the spot market. This may explain greater return volatility and dispersions around the mean responses in the futures market. The information flowing to the futures market may not be processed as accurately as the information flowing to the spot market. This uncertainty may cause the futures market to be more risky where the difference in risks may be a premium demanded by investors for their attempts to discover prices in the futures market and filter noisy information.

Performance Of GARCH And Neural Networks Models In Forecasting Futures Market Volatility

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Cash, futures and options market needs information such as the price, market and volatility forecast for hedging, spreading, speculating and decision-making in investment. It has become continuously apparent that swift and accurate forecasting method is indispensable for enhancing decision capabilities. This paper studies the performance of GARCH and Radial Basis Function Neural Networks (RBF) models in forecasting the volatility of daily Kuala Lumpur Composite Index Futures. The models are stationary GARCH, integrated GARCH, exponential GARCH, GARCH-M, exponential GARCH-M and numerous variations of RBF models. We observed that, among the models, the 5 best-selected RBF Models outperform all the GARCH models in one-step-ahead and out-of-sample forecasting. However, using the random walk model as the naïve benchmark, all the models are useful tools for forecasting the volatility of the index futures.

Forecasting The Dynamics Of Financial Analysts Recommendations: A Markovian Approach

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The dynamics of buy/hold/sell recommendations issued by financial analysts are analyzed, along with delistings from a stock exchange and company acquisitions. These states are used to model the behavior of stocks in the three major American stock exchanges (NYSE, NASDAQ, AMEX). A Markovian model is used. The transition probabilities and the average return per transition are determined for different time periods, ranging from one day to one year and one day to four

months, respectively. The period analyzed covers from Jan-1-1996 to Dec-31-2000 and includes 182,892 recommendations, 5986 stocks and 6842 analysts.
It is shown that in only a few cases the transition probabilities have changed since the beginning of the period considered and, in those cases, the changes have been smooth. This behavior shows that sudden or radical changes in the market do not imply sudden changes in the transition probabilities. Moreover, if one varies the period under analysis (from one week to one month to one year), the transition probabilities do not change significantly. Although the transition probabilities are relatively unaffected, other studies performed on the same dataset show that sudden changes in the market are manifested in the returns.
The observed behavior facilitates the understanding of the dynamics of the recommendations, by showing that the transition probabilities don't vary significantly in the short run and, thus, leaving the burden of accurate forecasts to the determination of the returns. Event studies and multi-factor regressions for the forecasting of returns are shown.
Using the above model, multi-period policies for maximizing returns are determined. It is found that the policy that produces largest returns is to (a) buy stocks that go to Strong Buys from Initiations, Buys and Holds, (b) hold them for 4 days and (c) sell them. The average monthly profit is 3.4%, not considering transaction costs.

June 19, Tuesday 10:40 - 12:00----Room: 211 ECC

Economic Forecasting
Chair: Kajal Lahiri (University at Albany, New York, USA)

Forecast-Based Model Selection In The Presence Of Structural Breaks

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It is now common knowledge that in-sample predictive ability need not imply out-of-sample predictive ability. This paper examines the usefulness of out-of-sample forecast tests as indicators of future predicative ability in the presence of structural breaks. In particular, using parametric regression models we present analytical, Monte Carlo and empirical evidence on the ability of 'simulated' out-of-sample tests to choose the best forecasting model. The out-of-sample tests include a Wald-type test suggested by Chao, Corradi and Swanson (2000), forecast encompassing tests suggested by Clark and McCracken (2000) and forecast accuracy tests suggested by McCracken (2000). For comparison, our analysis includes the standard in-sample F-test for exclusion restrictions, a metric frequently used in gauging predictive ability. Preliminary Monte Carlo evidence generally supports the analytical results. When a break towards equal predicative ability occurs, out-of-sample methods can lead to large increase in the probability of selecting the best forecasting model relative to that when in-sample methods are used. When a break away from equal predictive ability occurs, the in-sample tests usually dominate, but only marginally.

Testing For Structural Breaks In The Long-Run Means Of Vars

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Given the importance of the estimated drift in the forecasting performance of VARs with I (1) time series, the detection of structural breaks in these parameters is crucial in building VAR forecasting models. By de-coupling the short-run dynamics from the long-run means, Wald and CUSUM tests are developed that are more powerful than traditional methods. Importantly, the new tests are

relatively more powerful in the recent past, which is of particular importance for detecting new trends in forecasting models.

Joint Comparison Of Real-Time Economic Forecasts

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Using new procedures based on root mean squared error measures and their distributions, we compare out-of- sample real time forecast performance of small Bayesian VAR models with those of DRI and Wall Street Survey forecasters. We address a number of issues and difficulties inherent in assessing multivariate forecasts when macroeconomic variables are correlated contemporanously and through lags.

Evaluating Forecast Efficiency Of Social Security Disability Applications Using Panel Data

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The variation in the growth of disability applications over time and over regions in the U.S. is substantial and sometimes erratic. The resultant difficulty of prediction makes the management of disability programs very challenging. In this paper the efficiency of SSA's disability projections are evaluated using panel data on 51 state Disability Determination Services (DDSs) over 1988-1996. Even though the forecasts are unbiased, we rejected the efficiency property of rational expectations hypothesis quite resoundingly. We find that over this period, changes in the actual receipts have been systematically under-projected by over 26 percent on the average. Our empirical analysis unravels the mechanism SSA uses to generate yearly disability claims projections for each state.

June 19, Tuesday 10:40 - 12:00----Room: 109 ECC

Seasonal Models
Chair: Benoit Quenneville (Statistics Canada, Ottawa, Canada)

Testing For Deterministic Components In Seasonal Time Series

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In this article, the approach developed by King and Hillier (1985) is followed to derive locally best invariant unbiased (LBIU) tests for MA unit roots in ARIMA models. Under the null hypothesis, the cancellation of simplifying factors and noninvertible MA operators reveals the presence of deterministic components in seasonal time series. The finite critical values are computed using the Imhof (1961) procedure. Finally, The LBIU tests are applied to some real seasonal time series.

Moving Averages to Esitmate Seasonal Factors

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In classical decomposition a moving average of the same order as the seasonal cycle is calculated to remove the seasonal factor. When the time series is assumed to consist of Trend, Seasonal and Cyclical/Irregular
components combined multiplicatively, we show that, in fact, an additive seasonal factor remains in the moving average and centered moving average. The factors are small, but their presence leads to biased estimates of the seasonal factors. By taking a double moving average of the same order, we remove the additive factor and the bias. A simulation illustrates that the new procedure provides better estimates of the seasonal factors.

Using Shrinkage To Reduce Overestimation Of Seasonal Variation In Census X12 ARIMA

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In an earlier paper we demonstrated that empirical Bayes shrinkage consistently improves the accuracy of seasonality factors initially estimated through ratio-to-moving average classical decomposition. In this paper we investigate whether the application of empirical Bayes shrinkage also improves the estimates of seasonal factors initially estimated through Census X12-ARIMA. The X-12-ARIMA model is much more complex than classical decomposition. It deals with additional factors such as extreme data points, trading day variation, variation over time of seasonal effects, and the truncation of the trend-cycle that occurs in classical decomposition. This paper reports the results of a simulation study that emulated the characteristics of the seasonal, monthly members of the 111 series subset of the M-competition using two forms of empirical Bayes estimators to reduce the excessive variability of X11-ARIMA seasonal factors. These estimators are the widely known James-Stein method and a less widely known technique developed by G. H. Lemon and R. G. Krutchkoff. Preliminary results suggest that, where the underlying process has very high variability (the X-12 irregular component), use of shrinkage leads to considerable gains in accuracy. For lower variability, shrinkage leads to minor gain in accuracy. There is no evidence of lost accuracy with any use of empirical Bayes estimation.

Statistical Properties Of Predictiors Implied In Musgrave Asymmetric Averages In X-11

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The X-11 seasonal adjustment method uses Musgrave asymmetric averages to complement the Henderson symmetric average at the end of the series. It is only recently that an explicit formula for the coefficients of the Musgrave asymmetric average has been available (Findley et al., JBES, 1998) based on the work of Doherty (Working Paper, 1992). In this presentation, we first show how we can use this formula to derive the implicit forecasts associated with these Musgrave asymmetric averages. Like the Musgrave averages, these forecasts depend on a parameter. We show that by using pre-defined values for this parameter, we can obtain the implicit forecasts used in X-11-ARIMA and X-12-ARIMA. In concrete terms, this means that the X-11 trend-cycle asymmetric averages can now be expressed as the application of the symmetric Henderson average on the available series values extended with these implicit forecasts.
We also study the statistical properties of these implied predictors; discuss ways to estimate the parameter; and compare the predictions errors with those obtained by fixing the parameter to a given value like X-11 does, and those obtained from a more general ARIMA model.

Key words: ARIMA models, Henderson averages; Seasonal adjustment; X-11; X-11-ARIMA; X-12-ARIMA.

June 19, Tuesday 10:40 - 12:00----Room: 112 ECC

Govt: Housing
Chair: Bharat Barot (National Institute of Economic Research [NIER], Sweden)

Integrating Demographic Projection And Economic Forecasting - An Application And Its Future

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Forecasts of the numbers of households in future years are important for various planning purposes, particularly in the future new housing supplies and land use. Demographers and econometricians are interested in modeling household formation to gain further information. In Britain, the official household projection is produced using the headship rate method. It is essentially population trend-based, and does not allow for the social and economic influences being examined. The British Government is keen to improve the current projection method by bringing in more causal features.
The paper examines key economic effects on household formation in England. The household projection is integrated with economic forecasting. A set of Vector Error Correction Mechanism (VECM) models is developed to model the demographic and economic effects on the age-specific headship rates. Explanatory variables include demographic factors and key macroeconomic indicators such as economic activity rates, unemployment rates and real housing price. The Cointegration analysis is used to learn the long-run income effects. The model uses the secondary data developed mainly from national sample surveys. The model yields encouraging results for analyzing demographic and economic effects on household formation. Future numbers of households are forecasted and their responses to the sensitivity of key macroeconomic effects are tested. The integrating nature and the dynamic feature of the method shed a light on the possible further improvements of the household projection system.

A survey of Population Forecasting Practitioners

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In this paper, a brief description of a recent survey of population forecasters is presented. The survey covered the practitioners working at national government levels, at international development agencies or research organizations, academicians and researchers concerned about future population of different nations. The result of the survey revealed that in practice demographic forecasting is systematic and organized irrespective of the stage of development of each of the nation or country. Investigation of the survey suggests that short horizon demographic forecasts are more reliable than long range forecasts. The Cohort-component method is widely used and is the most preferred. To choose forecasting technique the factors, 'accuracy' and 'data availability' are main concern of all. Evaluation of previously made forecasts and error in forecasts are not seemed important to achieve forecasts accuracy. Based on the survey results the causes of forecast error and how accuracy can be achieved are discussed in this paper.

Keywords: Demographic Forecasts, Survey of Practitioners, Component Method, Forecast Error and Accuracy.

An Econometric Demand-Supply Model For Swedish Private Housing

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A housing market model for Sweden has been estimated on semiannual data for 1970-97 by separately modelling the demand and the supply sides, specified in error correction form . On the demand side in the short run house prices adjust to the changes in the real after tax long interest rate, financial wealth, the employment rate, rents and, finally, population. There is an underlying long run relationship between real house prices and the following ratios: debt to income, debt to financial wealth, private housing stock to income, the stock of rental housing (flats) to the private housing stock, the real after tax real long interest rate. The supply side, based on a Tobin=s q-index, the short interest rate and stock market returns, generates the investment flow which determines the evolution in stock. The results indicate that even in a turbulent period, Swedish house prices and housing investment are tracked quite well with this specification. The importance of the simulations and their usefulness to Swedish policy makers is discussed. According to our model, many factors were instrumental in producing the house price boom of the late-1980s. Initial debt levels were low as were real house prices, giving scope for rises in both, and these became more important as a result of financial liberalization, though partly offset by higher real interest rates. We also discuss the controversy over the causes of the 1991-1993 recession in the context of the 1991 Tax Reform. Tests of model adequacy indicate that the housing price and Tobin q housing investment models are stable and robust and satisfy intuitive theoretical prerequisites. The forecasts projected by the models for the year 1999 and 2000 are 8.3% and 8.5% while the outcomes are 9.5% and 9% respectively.

Keywords: House prices, error correction, steady state, Tobin=s q, simultaneous model

June 19, Tuesday 10:40 - 12:00----Room: 209 ECC

Forecasting Evaluation
Chair: Elliot Levy (US Department of Commerce, Washington, DC, USA)

Genetic Programming For Forecasting: An Evaluation Exercise

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Genetically programmed models are now perceived as potential forecasting tools that can provide not only accurate results, but also polynomial forms that aid in the understanding/interpretation of the data generating process. In a world where the availability of data is often not a problem and data intensive computations are increasingly popular, GP's are advocated as powerful tools to handle data complexity. In this paper we consider three case studies, where we compare and evaluate results as well as use standard time series models as benchmarks.

Artificial Neural Nets, Arima Methodology And Kalman Filtering Used In Time Series Modeling And Forecasting

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In this paper, we estimate eleven both real and simulated series (seasonal and nonseasonal, stationary and nonstationary) by using three alternative techniques such as one step-forward ARIMA methodology, Artificial Neural Nets and the Kalman Filter. After considering the adequacy of the respective models obtained to reproduce the pattern of the series, we have used them to forecast their values in the next future. Box-Jenkins methodology may be applied in two different ways. The first and a more conventional one, consist of getting, at a time, a number of N forecast for N periods forward. The second and the option chosen in this paper, consist of producing the same N forecast but including each time, the available additional data, which, when possible, is closer to real time forecasting. Regarding Artificial Neural Nets, the training algorithm used was "back-propagation", and overfitting was avoided by using the "early-stopping" method. The training of the net was carried out with the SNNS program. Finally, the results derived from Kalman Filter were obtained by using SCA and O-matrix Programs. We evaluate the above mentioned competing methodologies in forecasting and put forward the results obtained through this research.

Dynamic Programming Of Forecasting Apparatus

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In evaluating a matrix of standard errors of forecast by # of variables per model type, a deterministic DP solution was obtained for the optimal input. This matrix had inconsistent ranks of minimum input for best forecast results prior to the solution which yielded a bivariate model for most accurate results, even though other models went to the maximum # variables for feasible input. Also, a non-conventional ANOVA, variation from a grand minimum, jibed with the DP solution.

June 19, Tuesday 10:40 - 12:00----Room: 208 ECC

Technology Forecasting - 4
Chair: Robert Raeside (Napier University, Scotland, UK)

Biotechnology Forecasting On China In 2020

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The concept of technology forecasting is applied to the strategic investments in public research and development in emerging countries. China have to face with numerous problems such as 1.3-1.6 billion people, one-child family, aging society, pollution of the environment and sustainable development, in the first twenty years of the 21st century. The article summarizes 2001 Biotechnology Development Report (Chinese) which discussed the biotechnology roles in

sustainable agriculture, human health and biomass utilization in the country with the largest population in the world. Many experts think China will become the largest market of biotechnology industries and should allocate more research and development portfolio in biotechnology. The author also gives economic forecasting of biotechnology on China in 2020, based on 1.6 billion people, GDP of $3000 per person and continued advance along with advances in biotechnology.

Comparative Analysis Of Delphi Forecastings

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In this study the comparative analysis of Korea, Japan and Germany's Delphi forecasting in information and communication technology (ICT) was carried out. ICT, here, is divided into three categories: basic technology, core and component technology, and composite technology. Basic technology comprises semiconductor, computer, optoelectronics, and software, whereas core and component technology comprises transmission and switching technologies. Composite technology for application purposes includes satellite and mobile communication, networking, security, and broadcasting, multimedia communication and intelligent system technology. Each of key technologies by sub-field was internationally compared regarding its realization time, degree of importance, and degree of the experts participating in the forecasting. Some technological topics show large variances in their realization times. This means that experts from different nations had different views and prospects on the future of the technology concerned. Thus, reliability test of realization time was conducted. The test dealt with the precision of technological topic's realization time and its variance, which is affected by the degree of experts and by nation. Each nation's realization time in terms of median year was compared with its IQR (interquartile range). This may indirectly indicate the nations' technology gap among the three nations concerned. It was found that on the whole, the longer the time of the forecast, the bigger the variance. We also studied the difference of reliability between the response of all panel members and that of the panel members with high expertise. The result shows that there were substantially different views among panel members with high expertise on the realization time of the same technology. Korean experts were found to be optimistic in the future of ICT, favorably comparable to other two leading countries, Japan and Germany. It is expected that prospecting international technological trends from this study will contribute to formulating long-range plan for technological development in information and communication in Korea.

Forecasting New Markets: Using Growth Curves

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In strategic planning the potential of a new product in a new market is a vital but exceptionally problematic entity to assess. In this paper the use of growth curves ill be reviewed and it will be demonstrated that they are of little value unless one has a notion of the eventual saturation level of the market. Methods of estimating this level are considered, however, it is argued that with the escalating pace of change and the impending disruption to markets arising from demographic change and globalization that these methods must be viewed skeptically. The use of Catastrophe Theory in determining how uncertain future saturation levels are is investigated.

KeyWords: Growth Curves, New Markets, Saturation Level, Catastrophe Theory

June 19, Tuesday 10:40 - 12:00----Room: 208 ECC

Telecommunication - 1
Chair: Mr. Lauri Frank (University of Technology, Lappeenranta, Finland)

A Cost-Effective Method for Generating an Unbiased Sample When Complex Stratification is Necessary and Non-Response Rates are High

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The National Exchange Carrier Association (NECA), an association that sets wholesale rates for more than 1100 mainly rural telephone companies, recently faced the challenge of trying to produce an unbiased cost estimate for upgrading company networks to broadband capability. These companies are a very diverse group, operating in serving areas that are often very dissimilar from each other. They are also small and typically strapped for resources. Answering surveys is not high on their priority list. By necessity, NECA had to use a complex stratifying strategy. To derive the cost estimates, each company's wire centers were stratified by distance of the typical customer from a switch, the density of customers per square mile, and the number of customers served by a switch. Each stratifying variable had more than one category. Next, NECA collected actual cost information for wire centers known to heave been upgraded within each stratum. This was a nonrandom sample based on the objective of gaining at least 5 observations per cell from companies that NECA was in close contact. Then NECA sampled the remaining wire centers. On the first round, NECA used a simple random sample within each stratum to contact companies knowing that the non-response rate would be very high. The next stop was novel. A loss function was developed by squaring the difference between a cell's sample share of the total sample and the cell's population share of the total population. The second round of sample size for a cell was proportionate to its share of the total loss function. This approach produced a final sample that passed a Chi Square test used to test for an unbiased sample.

A Robust Method Of Identifying Shifts And Outliers In Ill-Behaved Time Series

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In the telecommunications industry, there is a wealth of data that can be used to track demand patterns. The sheer immensity of the information makes it difficult to identify significant changes in the marketplace. An automated system is a vital need. Yet, experience has shown that traditional shift/outlier identification techniques fail to work well, when applied to such "troublesome" time series, because they are based on unrealistic distributional assumptions.
Given the urgent business need to identify shifts and outliers in business data, NECA staff worked to develop a robust system for identifying time series shifts and outliers. The system called DATASCAN works very well when applied to ill-behaved time series. The system follows statistical rules, categorizes and estimates the sizes of shifts and outliers, isolates seasonal patterns, and handles a large number of series of unequal length. It can easily be expanded to include causal variables of particular interest.

The Forecasting Capability Of Diffusion Models On Wireless Telecommunications In Finland

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The basic diffusion models were introduced already in the 1960's. Today's business, especially in telecommunications, is very often described with uncertainty and high turbulence. The present paper will discuss the predictive validity of the basic diffusion models and some of their extensions on the telecommunications field in Finland.
The present paper tests the suitability of three basic diffusion models (Bass, Fourt & Woodlock, and Mansfield) on estimating and forecasting the diffusion of mobile subscriptions in Finland. These three models are further compared with traditional forecasting methods, like Box-Jenkins. Finland's situation as a first-mover country makes its diffusion path an interesting research subject: the diffusion has already reached maturity, which offers more observations for fitting the diffusion models. Furthermore, the diffusion process in Finland might tell something of the followers diffusion processes, which could be useful in making forecasts of the followers diffusion.
The basic diffusion models have been criticized for dependence on case and situation, and lack of generalization. Thus, several extensions of the basic diffusion models have been introduced. In this paper, by using the same data, the predictive capability of some extensions is examined. As a result, the present paper gives information on applying diffusion models on telecommunications data, and on the diffusion of wireless telecommunications in Finland. Finally, some propositions for future diffusion research in the field of telecommunications are given.

June 19, Tuesday 10:40 - 12:00----Room: 111/213

Non-Paranetruc Smoothing
Chair: Sandy D. Balkin (Ernst & Young LLP, Washington, DC, USA)

Time Series Forecasting Using Neural Network

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An Artificial Neural Network (ANN) is an information-processing paradigm inspired by the way the brain processes information. ANNs have been vigorously promoted in the computer science literature for tackling a wide variety of scientific problems. Recently, statisticians have started to investigate whether they are useful for tackling various statistical problems. Most of the interest in ANNs is motivated by their use as a universal function approximator. However, comparative studies with traditional statistical methods have given mixed results as to the added benefit they might provide.

This workshop will explain what neural networks are and how they can be used for time series forecasting. Model selection, estimation, and validation will be discussed using case studies from various business disciplines. Attendees will learn how to determine if a neural network is appropriate for a specific forecasting problem, and if so, how to approach implementation.

PARALLEL PLENARIES-Special Sessions: Tuesday 1:15 - 2:15 (Room: Willow)

A Research Agenda: Why Do We Waste Our Time Looking At Techniques Instead Of Institutions?

This parallel plenary will focus on the nature of forecasting research and asks the panelist to consider why we see so much work on methods and techniques and so little on institutions of forecasting.

Panelists:

Stuart Bretschneider, The Maxwell School, Department of Public Administration, Syracuse University

Robert Fildes, Department of Management Science, University of Lancster

Michael Lawrence, School of Information Systems, University of New South Wales

Keith Ord, The McDonough School of Business, Georgetown University

PARALLEL PLENARIES-Special Sessions: Tuesday 1:15 - 2:15 (Room: Peach)

The Future Of Financial Forecasting

Lawrence. D. Brown, Controllers RoundTable Research Professor, Georgia State University, J. Mack Robinson College of Business, 35 Broad Street, Room 504, P.O. Box 4050, Atlanta, GA 30302-4050, USA, ldb@gsu.edu
Marty Herzberg, Senior Director of Research, The DAIS Group, 2 World Trade Center, 58th floor, New York, NY 10048, USA, Tel: (212) 390-6130, Fax: 212 390-6958, MartyHerzberg@bridge.comBridge
Edward F. Keon, Jr., Director of Quantitative Research, Prudential Securities, ed_keon@prusec.com

The advent of the information technology age with easy access to vast amounts of timely data has all but eliminated the heretofore, easier profit opportunities within financial markets. Similarly, the recent Regulation FD ruling by the SEC has also removed an advantage enjoyed by many of having advance access to relevant company information. The panelists believe that such new realities will serve to encourage an increased use of quantitative techniques applied to large databases within the investment process. With respect to earnings forecasting this is already evident with a widespread shift from reliance on ordinary consensus data to individual analyst detail data for identifying superior analysts and generating
more accurate EPS forecasts. Regulation FD is likely to impact the accuracy and dispersion of analyst earnings forecasts and impact the profitability of investment strategies based on earnings surprises.

Panelists:

Lawrence D. Brown, Controllers RoundTable Research Professor, Georgia State University

Martin M. Herzberg, Senior Director of Research, The DAIS Group

Edward F. Keon, Jr., Director of Quantitative Research Prudentail Securities Inc.

PARALLEL PLENARIES-Special Sessions: Tuesday 1:15 - 2:15 (Room: 211 ECC)

The Future Of Forecasting: Recommendations From An Isf Working Group

Alan Porter will chair this interactive session.

Jerry Glenn, director of the AC/UNU Millenium Project, will introduce the session by raising critical issues concerning Forecasting's future. This parallel plenary will sum up the actions suggested by Monday's ISF brainstorming session for general ISF consideration and development of action recommendations to the International Institute of Forecasters.

June 19, Tuesday 2:30 - 3:30----Room: Peach (ACME)

Forecast Systems - 2
Chair: Hans Levenbach (Delphus, Inc., Morristown, NJ, USA)

Backcasting R&D Investments From Options-Based Strategies For Business Success

William B. Rouse, Enterprise Support Systems, 3295 River Exchange Drive, Suite 125, Norcross, GA 30092 USA, Tel: 770 441-3190, Fax: 770 441-9405, rouse@pop.mindspring.com

Forecasting R&D budgets, perhaps as a percentage of revenue, and then allocating these budgets prudently are standard elements of strategic management . Such investments are made with the assumption that needed technologies will emerge and enable future product lines that will generate revenue and profits, a portion of which can be reinvested in R&D to repeat the process. This practice begs the question of how much R&D is enough. One answer is that R&D investments should be sufficient to create the technology options that the company needs to achieve its long-term goals for revenue and profits. From this perspective, R&D investments represent, in effect, the purchase of options on the future of the company. These options, if exercised, usually require substantial downstream investments for facilities, equipment, working capital, etc. These downstream investments represent the exercise prices of the options. With this formulation, option pricing models can be used to value the technology options created by R&D . The resulting option values can be used to backcast R&D budgets necessary to purchase the options. This paper illustrates this procedure, including consideration of sensitivities to uncertainties surrounding technical and market success, as well as the consequences of success.

Detecting Change In Retail Product Mix Forecasting

Bill Sichel, 165 Rutgers Place, Clifton, New Jersey 07013, USA, Tel: 973-742-3210, Bsich@aol.com
Hans Levenbach, Delphus, Inc, 103 Washington St., Morristown, New Jersey, USA, Tel: 973-267-9269, Hans@Delphus.com

Manufacturers of consumer goods are in the "hot seat", contending with increasingly difficult and tenuous relationships with big retailers. To a large extent this reflects consolidation of retail department stores, store closures and changing distribution channels. But an equally important challenge to manufacturers has been the enormous proliferation in the number of product items or SKUs (Stock Keeping Units) they must handle to meet changing and diverse consumer demand. For example, men's white shirts as a percentage of all dress shirts fell from 72% in 1962 to only 21% in 1986. The proliferation of skus, in conjunction with retail stores orientation towards lean inventory positions, has consequences for manufacturers inventory holdings required to service their retail partners. The ability of manufacturers to improve their understanding of SKU level retail selling patterns and product-mix forecasting will beneficially allow them respond to changes in consumer demand and to position their inventory correctly. In this respect, not only is an understanding of the characteristics of patterns an important determinate, but an additional element of product-mix forecasting is the need to understand pattern characteristics both within product hierarchical levels and across product hierarchical levels or "relative" pattern recognition processes. In this paper we present an automated process, which through the utilization of simple

indexes,
promotes the definition of pattern characteristics and allows for "relative" pattern understanding across an unlimited number of hierarchical positions.

Making Sense of Data Proliferation in Sales Forecasting

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Over the years, new technologies have led to an explosive use of statistical data in all kinds of forecasting and planning applications. While much of this data needs to be transformed into useful information, forecast practitioners have not fully benefitted from this revolution in terms of software systems, modeling methods and decision support capabilities. In this talk we will present a framework for creating a data-driven forecasting process that results in efficient uses of computing and internet technologies for more accurate, reliable and defensible sales forecasting practices.

June 19, Tuesday 2:30 - 3:30----Room: 110 ECC

Exchange Rates - 1
Chair: K. Rao Kadiyala (Purdue University, West Lafayette, IN, USA)

The Impact Of Demography On The Real Exchange Rate

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In this paper we investigate the impact of demography on the Swedish real exchange rate, measured as the real TCW index, during 1960 to 2000. Time series regressions show that the Swedish demographic structure has significant explanatory power on the real exchange rate. A model using age shares alone as regressors is used for medium term out-of-sample forecasts, outperforming both a naive forecast and forecasts based on an autoregressive model. Finally we use the estimated model in order to make forecasts of the Swedish real exchange rate up to 2015. The model predicts that the Swedish age structure will have a depreciating effect on the real exchange rate up to 2007 followed by an appreciating effect in the end of the forecasting period.

Explaining Parity Reversion In Real Exchange Rate: Middle Income Country Case

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Purchasing power parity is one of the cornerstones in international economics and most research in open economy modeling assumes that PPP holds either in a narrow or a broader sense. On the empirical side, there is a growing body of the literature testing the validity of PPP. This literature has been mainly focused on industrialized countries. There is an extremely limited investigation of PPP in the specific context of emerging and developing countries (LDCs). However, there are reasons to suspect that real exchange rate behavior and relative price adjustments are different in LDCs compared to industrialized countries.
The purpose of this paper is to test the validity of PPP in a sample of (38) countries classified by

the World Bank as middle income economies over the period 1973-98. To circumvent the low power of traditional stationarity tests, we perform variance ratio and fractional integration tests in addition to Perron's test that accounts for potential structural breaks in real exchange rate process. Beyond estimating half lives shocks to PPP, this paper attempts to explain these estimates using a set of country specific variables as suggested by economic theory. The evidence suggests that reversion to parity tends to be faster in high inflation countries and that productivity improvement leads to a higher level of persistence. Openness to trade tends to reduce the extent of deviations from parity but this result does not appear to be statistically robust. Finally, evidence shows that parity reversion is less persistent under a fixed exchange rate regime and unrestricted capital mobility.

Comparison Of Forecasting Models As Applied To Foreign Exchange Rates Of Developing Countries

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Recent modeling efforts directed at foreign exchange rates have resulted in a number of techniques that appear to offer superior short range forecasting abilities over theory-based models, time series techniques,
or the benchmark naive random walk. A common feature of one of these modeling techniques is that it allows for nonstationarities in the levels of model variables as well as allowing for feedback relationships in the differences of the variables, which can provide insights into the direction and magnitude of future dependent variable movements. Variables exhibiting this unique type of relationship are termed cointegrated, which as shown by Engle and Granger (1987), allows for an ^Óerror correction^Ô parametrization of the model incorporating the level errors into the differenced representation of the model. Another modeling enhancement that has resulted in improved multivariate system forecasting techniques has been the introduction of priori information the modeler may have, or expect to exist, regarding variable behaviors within the model. Finally, one of the most recent techniques incorporates features of both the above mentioned techniques; that is, incorporating stochastic restrictions into an error correction multivariate specification. We evaluate the comparative forecasting ability of a range of models applied to parallel markets for foreign exchange rates. These models differ with respect to being either theoretical in nature or more closely associated with time series models. We also present a modified error correction representation of the Bilson-Frenkel model recast in first differences, with the static model serving as a proxy for the long-run equilibrium relationship between the variables. This model is augmented with a risk premium term, designed to capture a measure of the country^Òs international liquidity. To our knowledge, this is the first application of the integrated Bayesian vector error correction specification to be used in modeling parallel exchange rates.

June 19, Tuesday 2:30 - 3:30----Room: 211 ECC

Financial Forecasting
Chair, Lawrence D. Brown (Georgia State University, USA)

Are Sell-Side Analysts' Target Prices Realistic?

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I examine the properties and value-relevance of sell-side analysts' target prices. Analysts frequently provide target prices in support of the purchase recommendations. Target prices

typically reflect the analyst's projection of a stock price at some time in the near future, typically at a twelve to eighteen month horizon. An understanding of analysts' target prices is important to investors who rely on analysts' reports (or simply the primary outputs) in allocating capital, and the visibility of target prices has increased in recent years with the rise in the number of personal investment-related websites that routinely provide target prices. I investigate whether target prices are an unbiased predictor of future prices. I also investigate whether information in target prices is subsumed by the analysts' other primary outputs, earnings forecasts and purchase recommendations. I find that analysts' target prices are extremely optimistic, with a mean implied annual return of close to thirty percent. However, only less than one-third of target prices are attained. Finally, it appears that the information in target prices that is incremental to that in the analysts' other outputs, earnings forecasts and recommendations, is minimal.

Do Analyst Characteristics That Are Associated With Forecast Accuracy Matter To Investors?

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Prior research shows that earnings forecast accuracy is associated with analyst characteristics such as prior forecast accuracy, employer size, experience levels and forecast frequency. This study investigates whether these analyst characteristics are also associated with the stock market's response to analysts' forecast revisions. Our investigation is important because it can provide insights into both how investors incorporate analysts' forecasts in decision-making and how earnings expectations are formed. We find that the characteristics that are associated with forecast accuracy are generally also associated with investors' response to forecast revisions. However, analyst characteristics that are highly visible (such as employer size) appear to be more strongly associated with returns than they are with forecast accuracy. The results suggest that analysts' influence on security prices is more closely related to their visibility than to their forecast accuracy

Post-Earnings-Announcement Drift And Arbitrage Risk

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This study tests whether the magnitude of post-earnings-announcement drift is systematically related to the risk faced by arbitrageurs, such as hedge funds, who attempt to exploit informational advantages about stocks. Wurgler and Zhuravskaya (Journal of Business, forthcoming) develop measures of arbitrage risk
and show they are related to the abnormal returns associated with firms added to the S&P 500. I show that the magnitude of post-earnings-announcement drift is significantly positively correlated with arbitrage risk after controlling for other relevant variables. These results suggest that arbitrage risk represents an impediment to trading that prevents informed investors from eliminating the drift.

June 19, Tuesday 2:30 - 3:30----Room: 109 ECC

Econ Methods
Chair: Willie J. Belton, Jr. (Georgia Institute of Technology, Atlanta, GA, USA)

Predictability Memory Of Generalized Fractional Process

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From the predictability memory perspective, the fractional integration process has been extended to the generalized fractional process, and the latter has also been shown to be a long memory. The significance of this extension is the inclusion of periodic or quasi-periodic data in the long-memory model. From the simulated results a fractional white noise process has more predictability memory than a Gegenbauer process, but the periodic nature of the data is not allowed. Therefore a forecaster should be careful that the predictability memory might be different according to which model specification is used.

Ex Post And Ex Ante Prediction Of Multivariate Unobservable Economic Processes

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In this paper, a new optimal solution to the ex post prediction problem of multivariate unobservable economic processes (also called disaggregation of multiple time series) is presented. Additionally, a recursive optimal solution to the ex ante prediction problem is developed which extends known univariate results. Both solutions are based on structural time series models and the approach is more flexible and parsimonious than previous ones. The ex ante framework is used for developing statistical tests which permit to check the compatibility of pre-established economic goals with past and current observed data.

Producer And Consumer Price Inflation: An Investigation Of Second Moment Relationships

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To date, an overwhelming majority of the literature has addressed mean relationships between producer and consumer price inflation. Granger, Robins, and Engle (1986) represent the only attempt to investigate second moment relationships. We extend the research of Granger, Robins, and Engle (1986) by examining variance relationships in a GARCH-M framework which allows simultaneous estimation of the bivariate system. This research also breaks new ground in the use of core and cover-all inflation variance measures as well as in the examination of state dependent variance-variance and mean-variance relationships. We find that generally the variance of producer price inflation is causally related to the mean and variance of consumer price inflation and that exclusion of food and energy prices from price indices profoundly affects causal relationships. We also find that mean-variance and variance-variance relationships are significantly influenced by inflation regime shifts.

June 19, Tuesday 2:30 - 3:30----Room: 112 ECC

U.S. GOVERNMENT PANEL
Chair: Annette L. Clauson (U.S. Department of Agriculture, USA)

Forecasting in the U.S. Government

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The U.S. Federal Government is a major provider of forecasts for use by government policymakers and by business. Many forecasting programs have changed dramatically and some have been disbanded over the last few years due to declining budgets and changing priorities. At the same time, the demand for forecasting products that agencies produce continues unabated. In this session, the panelists discuss the forecasting programs at their agencies and address how forecasters can provide and disseminate relevant and useful information to policymakers and the public. Debra Gerald will discuss the Department of Education's education enrollment projections, which are important to education policymakers and to States. James Franklin will discuss the BLS employment projections, which are used extensively by business and by career councilors. Joy Harwood will discuss the forecasting program at U.S. Department of Agriculture, including both near term and long run forecasts of agricultural commodity prices and levels, which are closely watched by commodity markets.

Panelists

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June 19, Tuesday 2:30 - 3:30----Room: 209 ECC

Combining Forecasts
Chair: Michèle Hibon (INSEAD, France)

Comparing Information in Forecasts and Forecast Combination

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In this paper we demonstrate that forecast encompassing tests are valuable tools in getting an insight into why competing forecasts may be combined to produce a composite forecast which is superior to the individual forecasts. We also argue that results from forecast encompassing tests are potentially useful in model specification. We illustrate this using forecasts of quarterly UK consumption expenditure data from three classes of models: ARIMA, DHSY and VAR models.

A Conceptual Framework To Combine Forecasts Based On Classical Multivariate Analysis Methods

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In the new century, forecasting as another many tasks for managers is going to be characterised by the availability of a lot of methods. Moreover, the forecast horizons are every time more diverse. On the one hand, forecasts combining is an adequate methodology to handle the above scenario. On the other hand, such a setting is conceptually suitable to apply multivariate analysis. This paper reviews some of the main problems to combine efficiently forecasts and studies the way to employ several methods of multivariate analysis in those problems. In particular, a methodology to elaborate combined forecasts with a large number of forecasts is proposed. Finally, several practical contexts are considered in order to assess the usefulness of such methodology.

Combination of Forecasts of the M3-Competition: Michèle Hibon And Spyros Makridakis

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Aggregating information by combining forecasts from two or more forecasting methods is a successful alternative to using just a single method. In the M3-competition, the method Comb S-H-D is a simple average of the forecasts of the methods Single, Holt and Dampen-Trend exponential smoothing. Such combination provided not only excellent results that were more accurate that each of the three individual methods themselves but also proved to be one of the most accurate ways of forecasting. In this paper, we explore various alternative ways of combining forecasts by both weighting the various methods and by varying the number of methods being combined. The results are being compared with those obtained from similar combining schemes utilized with the data of the M-competition.

Keywords: Combined forecasts- M3-competition - Forecasting accuracy, SEAD, Boulevard de Constance, 77305-Fontainebleau, France

June 19, Tuesday 2:30 - 3:30----Room: 208 ECC

Technology Forecasting - 5
Chair: Sandy Kyrish (Temple University, USA)

Examining Moore's Law Using Data Envelopment Analysis

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Moore's Law is one of the mostly widely recognized and influential technology forecasts ever made. It states that performance of integrated circuits doubles about every 18 to 24 months. Performance is typically defined as a simple counting measure such as clock rate, transistor count, or a particular software benchmar suite. This paper develops a more complete model of microprocessor performance and then applies data envelopment analysis to evaluate the rate of change. Using

data on 54 microprocessors introduced between 1992 and 2000, the paper shows that the DEA's results are consistent with Moore's Law.

What Can Past Technological Forecasts Tell Us About the Future?

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With the arrival of the twenty-first century, it is a good time to review the forecasts of "One hundred technological innovations very likely in the last third of the twentieth century," published by Herman Kahn and Anthony Wiener in their 1967 book, The Year 2000, A Framework for Speculation on the Next Thirty-Three Years. In a rating of Khan and Wiener's 100 forecasts by a panel of knowledgeable technologists and futurists, fewer than 50% were judged good and timely. More than 55% - 60% did not occur in the twentieth century. However, when the 100 forecasts are grouped into nine broad technological fields (Infrastructure and Transportation, Health and Humans, Materials, Defense, Computers and Communication, Aerospace, Biotechnology and Agriculture, Environment, and Lifestyle), there are wide variations in the judged accuracy of the forecasts. In particular, forecasts in the field of Computers and Communication stand out as about 80% correct, while all other fields were judged 50% or less correct. Why were Kahn and Wiener's forecasts in Computers and Communication apparently so much better than for other fields? Have the technological drivers of the information age such as Moore's Law made this field more predictable than others? What lessons we can learn for forecasting currently emerging technologies?

Lessons From A 'Predictive History': What Videotex Told Us About The World Wide Web

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This study analyzes predictions and outcomes between 1981 and 1996 for U.S. residential online services, covering the rise and fall of videotex and the beginning of the World Wide Web. It presents the largely optimistic expectations for what was then a 'new technology' created by merging the television, telephone, and the computer. In the United States, videotex is often perceived as a major market failure that should have been easily apparent to avoid. But an analysis of the 'predictive history' of videotex demonstrates that success was constrained in multiple ways by the architectural possibilities of the time; predictors were ultimately prescient about many of the applications that would later be popular on an interactive network.

Perhaps the biggest obstacle to learning from the past is that we already know how it turned out. Normally, this is not seen to be a problem in research, being the usual starting point for retrospective analysis of media development. However, while post hoc analysis is useful for determining why things turned out the way they did, knowing about past outcomes makes it difficult not to see those outcomes today as inevitable and therefore predictable. Baruch Fischhoff contributes the term 'creeping determinism' to describe the human tendency to mentally reorganize historical outcomes into a linear and seemingly preordained process.

This study traces the history of videotex through the predictions and forecasts that accompanied its various stages, treating them as contextually plausible based on then-current conditions of technology and society. The study primarily focuses on the 1980s in the US, when videotex referred to an interactive information system enabling customers to use a hand-held keypad and television display screen (or a keyboard and passive terminal) to elicit screens of content from a centralized database, transmitted into a home or office via telephone lines or two-way cable. The

analysis suggests reasons why videotex did not succeed but also suggests that it prefigured the World Wide Web.

June 19, Tuesday 2:30 - 3:30----Room: 208 ECC

Telecommunication - 2
Chair: Mohsen Hamoudia (France Telecom Long Distance Strategy, France)

Demand Forecasting Of Mobile Phone Industry Using Competitive Diffusion Model: A Korean Case

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Diffusion models were developed to explain the diffusion process of new product introduces in a market and utilized to forecast the demand of new product or service. Particularly, as the information and communication industry is becoming important in recent, the diffusion models are paid attention to as an effective tool for the demand forecasts of subscription of new telecommunication services such as mobile phone and internet service. The objective of this research is an application of competitive diffusion model to the demand forecasting of mobile phone industry in Korea. In more detail, at first, a new diffusion model which extends the Bass model by incorporating competitive situation is presented. Secondly, using the newly suggested diffusion model as an empirical formula, we attempt demand forecasting of mobile phone service subscribers and finally we show the applicability of the model.

Forecasting The International Voice Traffic Flows By Worlwide Areas And By Country Pairs

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Markets being more and more open to competition, the largest international carriers lose significant market shares on their national markets and intensify their investments abroad to increase their businesses. France Telecom has increased its international business share in the global revenues growing from 9.3% in 1998 to 25.8% in 2000. France Telecom selectively invests markets with strong potential of development and builds strong partnerships with local companies aware of their own needs for their respective markets. Therefore, the knowledge of international traffic flows is of paramount importance for strategic positioning and thus essential to have forecasts traffic flows between the various countries. So, when France Telecom examines the interest of an acquisition of a holding in a foreign carrier, it is necessary to know both its strategic positioning and potential traffic. The acquisition of a holding is indeed determined by the acceptance of a business plan focused on a good vision of the future traffic.
In this paper we intend to show how a simple econometric model of demand allows medium term forecasts for Voice Traffic Flows for every worldwide area, and by country Pairs. The explanatory variables integrated in this model are qualitative, such as the common language spoken by the concerned countries of the bilateral route, the country proximity - higher proximity for France & Germany than France & Australia - the worlwide rank of each country (in terms of economic and social performances), the market liberalization & deregulation. The quantitative variables are GDP, Population and the number of Main Lines. The accuracy of forecasts generated by different

forecasting models is examined and used to build up a selection "strategy" for optimal forecasts at different lead times.

June 19, Tuesday 3:40 - 5:00----Room: Willow (ACME)

Market Analysis
Chair: Jeffrey S. Morrison (Equifax, Inc., Atlanta, GA, USA)

Managing Network Potential: Combining Market Segmentation And Simulation In A Retail Financial Service Environment

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The traditional financial sales network is a composite of units focused on individual markets. Overall network potential is thus best understood as the aggregate of the various sub-market potentials. In order to manage the overall network and rationally evaluate its potential, it is critical to define and then link the geographic configurations of the component sub-markets with systems that can simulate market operations and provide a basis for assessing sub-market performance. For financial service companies, management of its traditional branch network is onerous and costly. Non-traditional delivery techniques have begun to erode the market potential associated with traditional channels. To manage the traditional network more effectively, it is useful to configure a portfolio of market segments (i.e., sub-markets), incorporate these segments into a broader geographic definitional structure, and use these geographically segmented market structures within a simulation model that can identify growth, maintenance and pruning strategies. This paper will provide a case study of how this approach of integrating market segmentation and micro-market analytics was implemented at HSBC Bank in Buffalo, New York. Within the overall market encompassed by the Buffalo SMSA, a series of micro-market segments was defined using branch trade areas as the key organizing principle. Customer data was used to define unique trade areas for each branch office. Traditional and neural based clustering techniques were used to develop unique market clusters. Then the unique intra-market characteristics - demographic, economic and social - associated with the clusters were identified. For forecasting, the geographic definitions underlying these unique market clusters were incorporated into the MarketPrism modeling system developed by Heldman Associates. The system combines internal and external data with operational parameters that enables HSBC to explore simulations that quantify performance and potential over a planning period - typically a 1 to 5 year horizon. In addition to its role of establishing performance metrics for the existing branch network, the modeling system has been extended to encompass screening applications that focus on careful evaluations of new markets. All analyses were designed to mesh with a Geographic Information System for reporting to management and business units. This provides a unique view of the spatial parameters of the overall market and its constituent micro-markets for policy planning purposes.

Geo-Based Contingency Forecasting

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Understanding consumer behavior at an aggregate level is becoming increasingly important in an environment where competition abounds and management is under constant pressure to stress

test base line forecasts under a variety of conditions. For example, what would happen to a credit issuer's risk level if a general economic downturn were to occur? What would happen to revenues? What action plans could the company undertake to mitigate such losses? Evaluating and forecasting business activity at the geographic level accounts for local economies and allows decisions to be made as to where to grow the business, maximize profits, and when and where to implement conservative policies in future high risk areas. This presentation discusses how a technique called Pooled Cross-Section Time Series regression can be used to develop geo-based recessionary forecasts and provide a simulation platform for management's contingency planning initiatives.

June 19, Tuesday 3:40 - 5:00----Room: Peach (ACME)

Supply Chain
Chair: F.R. Johnston (University of Warwick, UK)

Logistics Cost Reduction Using Outsourcing Approach And A Model Design For Forecasting Logistics Activities

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Outsourcing logistics activities and partnering with others concerning logistical matter is quite common. Outsourcing allowed organizations to focus on their core competencies, to reduce the costs, to provide a differentiated level of customer service, reduction in staffing needs, and to take advantage of greater operational flexibility. This cost reduction is a strategy directed toward minimizing the variable costs, associated with movement and storage. The best strategy is usually formulated by evaluating alternative course of action, such as choosing different warehouse locations or transport models. At that point forecasting has a crucial role in logistic management. In this study, we will discuss the outsourcing concept in logistics and why companies use outsourcing tool to minimize their costs. In addition, the importance of forecasts in logistics activities will be considered to reduce delivery times. For this reason, a case study is given to explain the role of outsourcing. First, we will analyze the main problems of a company under consideration, which is activating as a supplier for the automotive industry. This company holds two auto parts manufacturing plants in its organization structure. The major problems for this company were: which plants should be used and which warehouses should they serve. The company is concerned to reduce costs, improve customer service, have a competitive advantage, and finally reduce risk and uncertainty. For this reason, this company wishes to outsource a part of their logistics activities.
We here designed a proposed structure to eliminate the distribution activities using outsourcing. According to model developed, all sheet metals can be obtained from domestic sources by an outside ABC logistics firm. In addition, the raw materials to be supplied should be moved to a master warehouse, which is commonly shared by two plants. This model also utilizes outsourcing approach to predict logistics activities. Finally, we presented a scenario with the statistical changes between the current and proposed structure and all benefits are expressed statistically.

Service Parts Forecasting - One Business, Two Forecasting Scenarios

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Overview: This paper will review the application of the Bayesian Application of Time Series/Dynamic Linear Modeling techniques that have been applied by Mercia Software to enable forecasting of fast and slow moving products in a single database, with an overview of the implementation of these techniques for service parts forecasting at Saturn Corporation.
In any business the pressure to maintain customer satisfaction is critical. This is most evident in a business that is required to provide parts for the ongoing service and repair of equipment, consumers purchased previously. Consumers have always and will continue to demand better service, higher quality and lower prices and clearly, something has to give.
Even without increased expectations, the forecasting of service parts has never been easy, and is often complicated by:

* An ever increasing range of service parts
* Regular product supersession / replacement
* A high risk of obsolescence
* A high percentage of slow moving parts
* Continuing business pressure to improve sales and profitability

Most service parts inventories can be split into two distinct groups of parts, 'fast moving' and 'slow moving'. Traditional forecasting systems have generally provided some form of statistical time series technique to develop forecasts of inventory requirements which works well for the fast movers, but has proven inadequate in dealing with the sparse and/or sporadic demand of the slow movers, resulting in:

* Labor intensive forecasting
* Inaccurate slow moving part forecasts, if any
* Fixed manually maintained re-order points

This session will focus on the application of advanced forecasting techniques to generate a forecast for slow moving or erratic demand products that have proven almost impossible to accurately forecast through standard time-series techniques. Included, will be an overview of the implementation of these techniques in a service parts environment at Saturn Corporation, however the techniques are equally applicable in any business that has similar 'problem' products.

Comparing Forecasting Methods: Impact On Stocks Management

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In this job, stocks management costs in a warehouse are calculated. For this purpose, eleven time series were used to represent the demand of a given product. The accuracy of the forecasting method that is used to forecast the demand, will affect the costs of the warehouse stocks. Three different techniques that forecast the future demand in the warehouse are compared: 1. Box-Jenkins; 2. Neural Networks, and 3. The best between Moving Averages and Exponential Smoothing. Some of these time series are stationary and others are non stationary, some are seasonal and others aren't. The reason for this variety of time series is to generalize the results that are obtained. The observations of each time series are divided in two sets: the first set is used to obtain the forecasting model, and the second set is used to compare the actual observations (actual demand) with the forecasts (future demands) obtained with each technique. These forecasts are used to manage the stocks policy of the warehouse, that is, calculating the lot size and the order periods. For this purpose, a deterministic demand study is carried out, using the

Wagner-Whitin. Lack of accuracy of these forecasting methods will result in overstocks or stockouts in some periods. Overstocks are penalized with the corresponding unit holding cost per period and, as stockouts are not allowed, in the case that any of the forecasting methods result in stockout for some periods, an overstock equivalent to the maximum stockout is added to each period.
The results for the eleven time series analyzed, clearly show that the simpler methods of forecasting (Moving Averages and Exponential Smoothing) are outperformed by more sophisticated methods (Box-Jenkins and Neural Networks). In just one single case, exponential smoothing equaled the results obtained with Neural Networks.

Keywords: Forecasting, Box-Jenkins, Neural Networks, Stocks Management.

The Size Of Orders From Customers; Charaterisation, Forecasting And Implications

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This paper reports work undertaken for a wholesale distributor of electrical fittings. The familiar 80:20 pattern of demands was observed, which meant that over half the item range (of 50000 items) moved less than 6 times per year.
When controlling the stock of these many slow moving items the size of customer orders dominates the calculation of the maximum and minimum stock levels. The issue data for the company has been examined, and various findings and relationships are reported. Different methods for characterizing the distribution of order size, and estimating the relevant parameters are compared and a particularly transparent method of forecasting the upper percentile points for future orders is proposed. The approach and the results are supported by data from other distributors, and the comments of users of the system are reported.

June 19, Tuesday 3:40 - 5:00----Room: 110 ECC

Exchange Rates - 2
Chair: Ben Vogelvang, (Vrije Universiteit Amsterdam, The Netherlands)

Exchange Rate Misalignment As A Source Of Vulnerability: An Assessment For The Case Of Turkey

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The currency crises appeared in the emerging markets in 1990s highlight the need to avoid overvalued real exchange rates that are incompatible with maintaining sustainable external accounts. Exchange rate that is potently out of line can be a starting point of a crisis as is typically the case in exchange-rate based disinflation programs. Dornbusch (2001) portrays the disinflation process as a result of a significant real appreciation and a widening current account deficit with the disappearance of growth from appreciation and increased interest rates required to attract continued financing. As the program is not self correcting, a speculative attack occurs to be possible inviting a currency depreciation where reserve depletion or high interest rates are not effective in defending the currency. The sustainable rates of real appreciation has become a crucial feature of the recent disinflation program that Turkey is currently implementing where a nominal anchor is provided by a forward-looking commitment to the exchange rate. There is also a pre-

announced exit strategy introducing a crawling-band regime by mid-2001. Following Goldfajn and Valdes (1996) as well as JP Morgan (2000), this paper derives an equilibrium real exchange rate (RER) model to rule on overvaluation. The analysis is based on an error-correction model using the regressors of RER fundamentals, i.e. terms of trade, output growth, openness to international trade and government spending. An alternative approach by decomposing the RER fundamentals into "permanent" and "transitory" components using Hodrick-Prescott filtering method is also exercised. The dynamics of the currency appreciations in Turkey with a special emphasis on the recent disinflation program is discussed and a comparison with other emerging markets having similar histories is provided. The overall conclusion is that the current real appreciation of the program seems to be sustainable as the government continues to comply with program targets.

The Dynamics And Stochastics Of Currency Betas Based On The Unbiasedness Hypothesis In Foreign Exchange Markets

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In this project we propose to investigate the dynamic and stochastic behavior of the beta coefficient (which we shall refer to as the currency beta) of the unbiasedness hypothesis (UH) in foreign exchange markets. We argue that the dynamics and stochastics of currency betas can be attributed to the dynamic behavior of various macroeconomic variables from different sectors of an economy, in addition to the trend variable considered in previous research. Incorporating four macroeconomic variables from the financial, real , and external sectors into the currency betas of ten currencies (developed and emerging) under a logarithmic change specification used to test the UH, we attempt to simultaneously test the behavior of currency betas in terms of nonstationarity, shifts in the mean and variance, and randomness. We are interested in the implications of the changing characteristics of currency betas for the reconciliation of the controversies and for the forecasting of future spot rates, across the developed and emerging countries under study.

The Effect of Exchange Rates On Commodity Prices - The Case Of Natural Rubber

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The Asian crisis has provided strong evidence on how exchange rates affect international prices. The more recent depreciation of the Euro currencies has also had substantial effects on the US dollar prices in the world market. In this paper we investigate these effects and focus on a commodity strongly represented in the Asian region, natural rubber (NR). It is first established that NR prices lead synthetic rubber prices. The long-run and short-run influence on the price of NR are analyzed along two lines: first according to the classical Engle-Granger procedure and afterwards by using the efficient estimator as described e.g. by Stock and Watson (1993) or Hamilton (1994). The dynamic GLS estimator is used. Both the long-run and the short-run show influences of production of NR, consumption of rubber and prices of other commodities. Besides we find confirmation for the theoretical model that predicts the effects of exchange rate changes: both the SDR/US$ exchange rate and the weighted real exchange rates of the NR producing countries. The analysis also shows that traders have changed their behaviour in connection with the Asian crisis.

Keywords: commodity markets, exchange rates, rubber prices.

June 19, Tuesday 3:40 - 5:00----Room: 211 ECC

GDP - 1
Chair: Bharat Barot (National Institute of Economic Research (NIER), Sweden)

A Growth Cycle Characterisation And Forecasting Of The Spanish Economy: 1970-1998

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In contrast to classical cycles, growth cycles are more likely to represent the present stage of economic activity. This paper analyzes the growth cycle chronology of the Spanish economy from 1970 to 1998, based on the official rules depicted by the Spanish Statistical Institute. Alternatively, we propose a simple method that not only anticipates such reference cycle but can also be used as a forecasting tool in predicting turning points. Given these good properties, the method is also used in computing the so called "stylised facts" among the main economic aggregates.

Restricted Forecasts Of Multiple Economic Time Series As A Tool To Monitor Inflation And GDP Targets: The Mexican Economy Case

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In this work we extend the results available for the univariate and multivariate restricted forecasting situations. We consider monitoring the simultaneous fulfillment of several targets that may be known for some economic variables. These variables are assumed to be part of a time series vector for which a Vector Autoregression with Error Correction Mechanism can be built. We propose using first a compatibility test to find out whether the attempted goals are compatible with the observed record of the multiple time series. Then we take into account the economic targets as (binding or unbinding) restrictions that must be satisfied by the time series forecasts. In order to obtain the optimal combination of restrictions and unrestricted forecasts of the time series model we employ restricted forecasting, which enables us to make statistical inferences and, in particular, calculate prediction intervals. The empirical application considers a six-variable Vector Autoregression of the Mexican Economy, with emphasis on Inflation rate and Gross Domestic Product.

Can Oil Shocks Explain Asymmetries In The US Business Cycle?

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We consider whether oil prices can account for business cycle asymmetries. We test for asymmetries based on the Markov switching autoregressive model popularized by Hamilton (1989), using the tests devised by Clements and Krolzig (1998) select the transformation of the oil price of Lee (1995), based on a linear analysis of the relationship between output growth and the oil price employing PcGets. We find overwhelming evidence against the conventional wisdom that

recessions are more violent than expansions: while some part of the downturn in economic activity that characterises recessionary periods can be
attributed to dramatic changes in the price of oil, post-War US economic growth is characterized by the steepness of expansions.

Growth Accounting And The Business Cycle For The Private Business Sectors Of The Swedish Economy (1960 - 1999)

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This paper is concerned with the nature of economic growth in 9 sectors of the private business sectors of the Swedish economy between 1963-1999. The results of the study indicate that there is substantial heterogeneity (both across sectors and time) in rates of value-added, hours worked, labour productivity and Total Factor Productivity during the sample period. The decline in constant price value-added in the private business sector during the sample period is associated with significant changes in the relative size of individual sectors.
The growth accounting execise for four different sub periods reveals a decline in TFP after (1960-1969) i.e. the end of the postwar "golden era" due to two oil shocks from 1973-1979 In the 1980's TFP picked up but again to slowdown in the begining of the 1990s. After the first half of 1990s TFP has speeded up for the manufacturing, wholesale and retail trade, banking, goods and service producing sectors and the private business sector. While TFP has accelerated during the second half of the 1990s with the recovery from the recession of the early 1990s, it is unclear to what extent this change is primarily cyclical or structural.For the sake of comparison with the real business cycle literature we use the standard practice of taking logs and Hodrick-Prescott filtering the data. Cross correlations of detrended output, hours, investment and TFP at different leads and lags indicate that TFP leads investment, and hours worked and TFP and GDP for all the sectors is procyclical. Hence the decomposition of TFP into trend and cyclical component gives reasonable results . Chow tests with a dynamic specification of TFP for the private business sectors of the economy indicate structural breaks for manufacturing, transport and community services in 1973, in construction in 1979, and in 1992 in the banking real estate and other business. Granger causility tests indicate that TFP in the banking and real estate sector Granger causes TFP in the agriculture, manufacturing, and transport sectors. Simple cross correlations indicate that TFP, hours worked and the share going to capital are procyclical while capital stocks and the share going to labour are contracyclical.

June 19, Tuesday 3:40 - 5:00----Room: 109 ECC

Time-Series Methods
Chair: James A. Brox (University of Waterloo, Waterloo, ON, USA)

Estimation In Non-Stationary Arfima Processes Using Semiparametric And Parametric Methods

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Recently, the study of time has been focused on time series having the long memory property, that is, series in which the dependence between distant observations is not negligible. One model that shows properties of long memory is the ARFIMA(p,d,q) when the degree of differencing d is in the interval (0.0,0.5), range where the process is stationary. In this work, we analyze the estimation of the degree d* in ARFIMA(p,d*,q) processes when d*>0.5, that is, when the processes are non-stationary, but still have the property of long memory. We conduct a study, through simulations, to evaluate the behaviour of well known semiparametric and parametric methods of stationary ARFIMA process for d*, including the short-run parameters, for small and large sample sizes. Cases where the innovations are not Gaussian distributed are also considered. The methodology is applied to a well known data set, the so-called UK short interest rates.

Significance Levels Of The Ljung-Box Statistic For Univariate Stationary Long Memory Process

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This paper investigates the empirical significance levels for different nominal levels of the goodness of fit Ljung-Box test for the ARFIMA process. Our simulation results indicate that the type I error can be affected by: the choice of the number of residual autocorrelations, k, involved; the order of the process, the method for estimating the fractional parameter and the sample size. We also take into account the case where the innovations are not Gaussian.

Forecasting Of Incomplete Stationary Time Series

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The area of time series analysis is based on the assumption that observations are available at discrete equispaced intervals of time. Quite often, problems with missing data occur, frequently forcing statisticians to apply ad hoc methods. Because the foundation of time series analysis is based on a complete set of observations, new methods or modifications to the existing methods must be developed to facilitate complete analysis. Two methods - the Pseudo EM (PEM) algorithm and Jones' Maximum Likelihood method - were used in a simulation study to reconstruct the time series in the presence of 10, 25, and 50% missing data. Resulting parameters were used to create forecasts that were compared to true data values. In this paper the methods used and the accuracy of those forecasts are discussed.

Forecasting Willingness To Pay For Improved Parkland Facilities In The Presence Of Non-Response Bias

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The paper represents an attempt to deal with the problem of missing responses in contingent valuation surveys utilising a payment card method, applying a grouped-data sample-selection technique that is capable of estimating the missing values conditional upon a respondent's decision to answer a willingness to pay question. The advantages of the technique lie in its ability to utilize the entire sample and to allow for possible correlation between the decision to answer the question

and the amount reported, thereby permitting more efficient estimation. The technique is then used to forecast the willingness to pay for improved parkland facilities in the Grand River watershed southwest of Toronto, Canada, utilizing a contingent valuation survey of the area's residents conducted in 1994. We find that, compared with direct sample estimates, the use of the technique reduces the standard error of the estimated average willingness to pay by one third to one half. As regards the determinants of the willingness to pay, the study points to the importance of a number of environment related varibles indicative of the current state of the parkland facilities as well as survey respondents' attitudes and beliefs on environmental issues.

June 19, Tuesday 3:40 - 5:00----Room: 112 ECC

Forecaster Needs
Chair: Christopher Stanard (GE Corporate Research & Development, NY, USA)

New And Needed: Forecasting Tools, Techniques, And Marketable Skills

Description: An industry roundtable discussion on new and needed state of the art forecasting tools, techniques, and skills of interest to business today in helping solve complex problems and getting needed results. Discussion will cover topics such as useful statistical, data mining, economic, financial, industrial, business, and health related forecasting issues and tools. Focus will include what industry needs and what in terms of new and emerging tools, techniques, and skills. Applications to specific business cases will also be discussed.

The participants will structure their talk as follows:

1. A general discussion and ideas for the on forecasting by participant. (This part is intended to be free-form and basically allow the participant to talk about whatever general or specific areas they want to highlight or discuss.)
2. A general discussion on ways to approach a pre-chosen financial forecasting example. Tools, steps, approaches, caveats and warnings, special issues, or/and philosopy - that type of thing.

Participants:

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June 19, Tuesday 3:40 - 5:00----Room: 209 ECC

Judgemental - 1
Chair: Michael Lawrence (University of New South Wales, Australia)

An Examination Of Heuristic Identification Of Functional Form For Rule-Based Forecasting

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Judgmental identification of time series features has been an expensive and time-consuming task. In Rule-Based Forecasting, judgmental identification has posed an additional limitation on its replicability and refinement. To overcome these constraints, Adya, et al (2001) proposed heuristics for the identification of six features of time series. These were automated and integrated with the original RBF. Forecast accuracy of heuristic codings was compared with that of judgmental coding on 122 series from the M-competition. Results indicated that despite some disagreements between judgmental and heuristic identification of time series, RBFs accuracy did not suffer. However, Adya, et al (2001) did not isolate the impact of individual feature disagreements on forecast accuracy. One feature that caused concern was functional form for which there was no agreement between judgmental and heuristic coding of features. In this study, we isolate the impact of functional form on the accuracy of RBF by using the original judgmental codings from RBF for all features other than functional form. The forecast errors from heuristic identification of functional form will be compared with those from judgmental coding. If heuristic identification has an adverse impact on RBFs accuracy, then the heuristic needs to be reexamined. On the other hand, contrary results would pose interesting implications for judgmental identification of features.

Combining Judgmental And Statistical Forecasts To Improve Forecast Performance

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This study investigates whether combining judgmental forecasts with traditional modeling methods improves the forecasting accuracy of U.S. food prices. ARIMA (Box Jenkins), Time Series, Demand, and Inverse Demand (Box Jenkins) models combined with judgmental forecasts will be compared. One of the main justifications for the integration of judgmental forecasts and statistical methods occurs when time series have discontinuities caused by sporadic events. In the case of food prices, structural change, inflation, weather, and changing consumer tastes and preferences can lead to short-term or long-term changes. If an analyst relies only on statistical methods for forecasting food prices, the changes may be treated as white noise. And judgmental forecasts alone may be biased, if the introduction of new data causes a forecaster to overreact. The individual and the combined forecasts will be evaluated for accuracy, with the benefits of combining forecasts analyzed. The effectiveness of different combination methods will also be evaluated.

Improving Forecast Utilisation By Providing Explanations.

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Research in a wide variety of settings has shown a reluctance for people to use the decision advice produced by computer based models. In the forecasting domain, this tendency has been demonstrated to be a significant problem to effective system implementation. In the search for ways to make the forecasts provided by a forecasting decision support system more likely to be trusted and utilised, this research has investigated providing an explanation along with the forecast. These explanations can be either technical (i.e. discussing the type of technique used, and reasons for its adoption) or management (focussing on the meaning of the forecast in the light of the time series history) or a combination of both. Typically, forecasting systems have provided just a bare numeric value or set of values. Providing explanations has been demonstrated to be of great value in enhancing user acceptance of expert systems advice but no one has investigated their use in a decision support system. In a laboratory setting, forecast users were given a system which provided them with both a forecast and an explanation (either a technical or management explanation or both). Other users forecasted the same set of products using the same system but without the explanations. The results of this study will be presented and discussed.

June 19, Tuesday 3:40 - 5:00----Room: 208 ECC

Trans National Cooperation
Chair: Dr. Guenter Clar (European Commission, Brussels, Belgium)

Developing Foresight For Large Territories: The Way Forward To Strengthen The Strategic Basis For Policymaking In Knowledge-Based, Globalised Markets

Background: Rationale For Sub-National And National Foresight, But At The Same Time Growing Need For Trans-National Activities

Societies are more "knowledge-driven", markets have become essentially globalised, and market opportunities appear and disappear rapidly. This increases the difficulties to identify emerging generic technologies likely to yield the greatest economic and social benefits, to invest successfully in Research and Technology Development (RTD), and to make the industrial and societal choices that turn these investments into innovation and quality of life in the long run. Therefore, policy makers in the public and private domain depend more and more on reliable systems detecting relevant signals early, evaluating risks and opportunities of Science and Technology developments comprehensively, and putting all related parts in a system perspective.
Technology Foresight / Technology Assessment methodology (TA/TF) has increasingly been recognised as a powerful, broadly applicable set of instruments for developing common views on, and giving strategic directions for future development strategies. One of the acknowledged merits of the type of TA/TF methodology developing in the last decade, is indeed to mobilise broad sections of all the parties interested in RTDI policies and their impacts on society, to give collective thought on priorities, and thus to prompt a broad societal debate. This is why governments, companies, and other major players in innovation systems, have been adopting Foresight methods or establishing specialised Foresight organisations in a growing number of countries. Even where this was not the case, networks for knowledge creation, exchange, and transformation have been developed in the public and private domain seeking to provide direction to RTDI policies, building up capabilities for strategic flexibility to adequately react to and shape technological and societal change (embedded Foresight).
In spite of this general usefulness and applicability two lessons had to be learnt, sometimes painfully: For foresight exercises to be successful, all actors and their interactions, frameworks and basic conditions, and societal aspects and dimensions of today's complex and fast changing innovation systems have to be taken into account thoroughly. Considerable (financial, human, time) resources have to be spent to bring about timely and meaningful results. Therefore, for nations the size of France or Germany, or even Finland it is increasingly questioned if running full-fledged foresight exercises is still feasible and desirable. In consequence, the potential of sub-

national and sectorial foresight is being explored more systematically, as well as synergies from linking these new activities to ongoing activities at national level.
On the other hand, for foresight results to be useful for actors having to perform in fast changing, globalised markets, it is of utmost importance to take trans-national and global influences and developments into account. The supra-national character of many problems, the need for achieving economies of scale, together with the high resource intensity of foresight processes, gives incentives enough to develop new processes linking sub-national, national, and trans-national foresight and related activities. For example, first steps have already been taken by the European Union towards strengthening the European dimension of these activities, and UNIDO has created platforms of exchange for the Central and Eastern European countries (CEEC), and for Latin America. Strategies for large countries like Brazil, China, India or the USA f. ex., are confronted with similar challenges when developing respective activities.
In general, the activities developed at the level of large territories seem to be far from satisfying the increasing demand. The European Commission, for example, aims at developing a coherent supportive framework at the European level. A new Directorate in its General Directorate for Research has been established to develop and implement respective strategies together with the Member States and other European Institutions.

The ISF session

This session was conceived to address the growing need for, the specific opportunities to be expected from, but also the difficulties of managing and justifying foresight activities for large territories (quantity of resources and persons to be involved, complexity of the processes, "usefulness" and applicability of results, etc.). With participants coming from the EU, UNIDO, Brazil and the US, experiences as well as future plans are discussed. The session aims at learning from each other, incentivating new ventures, and exploring possibilities of an increased and more systematic information-sharing and co-operation in the future. This might include joint conceptualisation, supporting mechanisms, and the use of results with the objective to complement and mutually strengthen ongoing activities in and between the respective territories.

Presentations:

Dr. Günter Clar, European Commission, DG Research, Directorate Science and Technology Foresight; links with the IPTS, Brussels, Belgium (on the EU experience and new activities planned in its next Research Framework Programme)

Hal Linstone, Portland State University; Editor of Technological Forecasting and Social Change (on topics to be considered to design successful approaches)

Joe Coates, Consulting Futurist, Washington (on US experience)

Carlos E. Chanduvi Suarez, UNIDO, Vienna (on UNIDO's Technology Foresight Initiative for Latin America)

Dr. Helio Guedes de Campos Barros, Ministry of Science and Technology, Brasilia, Brazil (on the Brazilian experience, especially the PROSPECTAR case).

As Dr. Chatri Sripaipan, Bangkok, cannot participate personally information on the activities of APEC's Center for Technology Foresight will be displayed.

In the discussion following the presentations, all aspects relevant to structured future thinking could be covered, e.g.

· Platforms / networks for disseminating the results of national and sub-national activities and for integrating results from these different levels, and from different societal / industrial sectors;
· development of technical tools and societal processes for "complementary" Foresight exercises at different levels and for an efficient use at all levels involved;
· capacity and institutional development (for foresight practitioners);
· creating forward thinking culture in society as a whole, adapting education and improving awareness building;
· development of joint Foresight exercises on certain common-interest topics.

June 19, Tuesday 3:40 - 5:00----Room: 210 ECC

Energy Application
Chair: Max Stevenson (University of Technology Sydney, Australia)

An Integrated Forecasting System For Short Term Load Profiles

Helio F. da Silva and Reinaldo C. Souza (Presenter), Pontificia Universidade Catolica do Rio de Janeiro
Lilian M. de Menezes, Dept. of Mathematical and Computing Sciences, Goldsmiths College, University of London, New Cross, London SE14 6NW, Tel: 44 207919 7862, Fax: 44 207919 7853, l.demenezes@gold.ac.uk or reinaldo@ele.puc-rio.br

Electric load forecasting is key to energy planning and decision making. We consider the operation of the electric system and thus short-term predictions, which use the most recent values of the demand together with past information on the time series behavior and/or other factors that may influence the load. The results is an automated interactive forecasting system that: 1. corrects possible irregularities in the demand data, which may result from metering or other failures, by using a modified version of the Kalman Filter; 2. identifies and forecasts the cardinal points in the daily load profile (using artificial neural networks and Kohonen classifier); 3. uses cubic splines to arrive at the complete daily profile. We illustrate the system's performance with 10-min and half-hourly data from ONS / ELETROBRAS - period 1996, 1997 and 1998 - of the utility LIGHT which covers the city of Rio de Janeiro and its neighborhood.

Annual Electrical Peak Load Forecasting With Prediction Interval

Elvira N. Loredo, Univeristy of Arizona, Dept of Industrial Engineering, P.O. Box 875906, Tempe, AZ 85287, USA, Tel: 480 965-9068, elvira.loredo@asu.edu, enloredo@imap4.asu.edu

Electrical peak load results when various demand components coincide causing electrical demand to reach its highest point. An accurate forecast of the annual peak load is important to capacity planning in electrical utilities. This paper applies Extreme Value Theory and Generalized Linear Models to the problem of predicting an annual peak and establishing a prediction interval. Intrinsic problems of autocorrelation in the response are dealt with by selecting responses above a threshold. The resulting responses are found to be Weibull distributed, one of a class of Extreme Value distributions.

A Hybrid (Neural Net & Dynamic Regression) Model To Forecast Petrol Consumption In Brazil

A. Zanini, Prof. Reinaldo Castro Souza, C. E. Pedreira, DEE, PUC-Rio, Rua Marques de Sao Vicente, 225, Gavea 22453-900, Rio de Janeiro, RJ, Brazil, Tel: 55-21-5299510, Fax: 55-21-5113319

In Brazil, the energy sector in general, and that of oil and natural gas in particular, is undergoing far-reaching and complex processes of institutional restructuring. In this new environment, competition is starts to play a key role in the regulation of these sectors. As a consequence accurate and robust forecasting system are required. In this paper a short term model to forecast automotive gasoline demand in Brazil is proposed. From the methodological point of view, data is analyzed and a model using a bottom-up strategy is developed. In other words, a simple model is improved step by step until a proper model that fits well the reality is found. Departuring from a univariate model it ends up in a neural network formulation, passing through dynamic regression models. The models obtained in this scheme are compared according to some criterion, mainly forecast accuracy. We conclude, that the efficiency of putting together classical statistics models (such as Box & Jenkins and dynamic regression) and neural networks improve the forecasting results. This result is highly desirable in modeling time series and, particularly, to the short-term forecast of automotive gasoline, object of this paper.

Keywords: automotive gasoline, forecast, neural networks, statistics models.

Filtering And Forecasting Spot Electricity Prices In The Increasingly Deregulated Australian National Electricity Market

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Spot electricity prices in Australia's increasingly deregulated National Electricity Market are traded with prices set every half-hour. One effect of deregulation is increased volatility of these half-hour prices, necessitating the need to manage the associated risk imposed on the producers and consumers of electricity. The various financial derivatives used to hedge exposure to electricity prices, along with the implementation of Value at Risk as a risk management technique for portfolios containing electricity derivatives, require an estimate of future price volatility. The focus of this paper is the forecasting of the future spot electricity price series from which an estimate of volatility can be obtained. By applying a wavelet transform to realisations of the spot price and demand series, and by further smoothing with both high- and low-pass filters at different levels of resolution, we de-noise the data. This filtering serves to reduce contamination of the underlying signal in the price series, caused by leakage from abnormally high (and low) and rapidly mean-reverting prices. Using the filtered spot price and demand series, we evaluate time series models from the threshold autoregressive (TAR) and autoregressive moving average (ARMA) classes to determine their suitability for forecasting spot electricity prices. We find that a model from the TAR class produces a forecast that captures the mean and variance components of both the filtered and unfiltered data.

June 20, Wednesday 8:10-9:10----Room: Willow (ACME)

KEYNOTE SPEECH 3
Forecast Knowledge
Chair: Robert Fildes

Generation And Diffusion Of Knowledge On Forecasting: We Have A Problem!

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We strive to develop knowledge in forecasting, yet organizations continue to use faulty procedures and make disastrous forecasts. What is going wrong? Normal science, with a reward system that revolves around journal publication, generates papers, but stifles useful knowledge (defined here as findings that tell what to do under given conditions; i.e., "principles.") I illustrate difficulties in the creation and diffusion of principles with accounts of research on causal forces and other innovations. A review of research on scientific publication and analyses of papers contributing to forecasting principles led to a number of conclusions. First, principles are more commonly found in work that is not censored by peer review (e.g., invited papers). Second, a number of steps would aid in the generation and diffusion of forecasting principles: Researchers should study important principles about which we know little; make tests of competing hypotheses, especially with conditions specified; and write in an intelligible manner. Journals should reform the role of peer review so that censorship is not used, a step that is now economically feasible. Software should incorporate the latest principles. Websites should become the primary means of communicating findings about forecasting principles; to achieve this, I invite volunteers for the forecastingprinciples.com site.

J. Scott Armstrong, Professor of Marketing at the Wharton School of the University of Pennsylvania, is a founder of the Journal of Forecasting and the International Journal of Forecasting. He is the editor of Principles of Forecasting: A Handbook for Researchers and Practitioners (Kluwer 2001). Currently, he is devoted to improving the Forecasting Principles website (forecastingprinciples.com), which he started in 1997.

June 20, Wed 9:25 - 10:25----Room: Willow (ACME)

Forecast Management - 1
Chair: Renee Speicher (Cap Gemini Ernst and Young, Kansas City, MO, USA)

How Forecasts Can By Used In Every Aspect Of The Company

Asgeir Jonsson, Logistic Manager, The Brewery Egill Skallagrimsson LTD, Grjothals 7 - 11, 130 Reykjavik, Iceland, Tel: 354-580-9068, Fax: 354-580-9090, asgeir@egils.is

Who needs forecasts? Who can use forecasts? What tools and methods does a company need to adopt in order to maximize the utilization of forecasts? These are the questions that I am going to answer in this presentation. Not only can sales managers and financial managers use forecasts, but forecasts can also be looked at, as something that almost everything in the operation of the company is based on, including much of the operation of the suppliers. To understand the whole process of forecast utilization, it is important to think of this from an ECR point of view (efficient consumer responding). Many of the tools that are used in ECR influence the use of the forecasts. I will explain how Continuous Replenishment, Computer Assisted Ordering, Integrate Suppliers and Synchronized Production can best utilize available forecasts.

A Certified Forecaster?

Robert Fildes, President, International Institute of Forecasters, Department of Management Science Lancaster University, UK. LA1 4YX Email: R.Fildes@Lancaster.ac.ukTel: 44 - (0) - 1524 - 593879

This presentation and discussion will examine two aspects of the proposal to move ahead with developing an educational programme for forecasters associated with certification. Barriers to moving forward include the need for formal institutional arrangements, legal issues and resources needed. Most importantly, the presentation will consider the training and experience expected from a forecaster and how this might be evaluated.

Conducting CPFR On Digital Marketplaces: Reality Or Myth?

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This study will reveal key elements of the business practice known as CPFR (Collaborative Planning, Forecasting and Replenishment) within Fortune 500 organizations. Additionally, this research will seek to discover and predict how CPFR will evolve as select processes are provided within public digital marketplaces rather than among protected, pre-arranged trading relationships. The study is dissected into three distinct research components: taxonomy and construct development; instrument construction; instrument administration and analysis. For the purposes of the ISF panel, the taxonomy and construct development will be discussed at length. Population sample, initial construct development, interview guide and the emergent taxonomy construction will be discussed. As CPFR within digital marketplaces is a novel construct, piloting and pre-testing is an essential stage within the research agenda to ensure validity of the instrument. The instrument construction will be outlined, although, in less detail. The statistical applications (such as Pearson correlation, MANOVA, Step-wise regression) intended for the instrument analysis will be discussed.

June 20, Wed 9:25 - 10:25----Room: Peach (ACME)

Transportation
Chair: Dr. John Adams (Napier University, Scotland, UK)

Long-Term Forecasting Of Air Traffic Delays Using Time Series Methods

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This paper describes the forecasting, up to six years in advance, of FAA Operations Network (OPSNET) monthly weather-, volume-, and equipment-related delay rates and Airline Service Quality Performance (ASQP) monthly average arrival delays. The forecasts are based on a seasonal linear model fit to historical data by simulated annealing using the least squares criterion. Within-sample forecast errors are shown to be serially uncorrelated and approximately normal, which allows confidence intervals to be calculated for the forecasts. The procedure was validated by sample splitting; in the case of OPSNET delay rates, for which ten years of data were available, the first five (or seven) years of data were used to fit the model, the model was used to forecast delay rates up to five (or three) years beyond the data used for fitting, and the remainder of the historical data was used to assess forecast accuracy. The within-sample mean square forecast errors of other linear, generalized linear, and nonlinear models of the OPSNET delay rates are reported.

Air Passenger Growth Forecasts For The United Kingdom: Past Performance, Accuracy And Implications For Demand 'Management'

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Forecasts of private sector activity by Government agencies are increasingly being used as useful planning and policy design tools where the activity is considered to present a potential environmental and/or economic threat in relation to the social costs it may be or is likely to impose. In the United Kingdom serious Government concern is currently being expressed in relation to the forecasts of air passenger traffic growth and the implications of this for the environment. In the 1990's air passenger growth exceeded 70 percent in the UK and Government forecasts suggest this trend is likely to continue (moderately only slightly) into the next decade. Unless demand constraining policies are implemented the environmental impacts of such growth are likely to be very significant. However such policies themselves may threaten the UK's position as a major international hub and damage its economic prospects. With this background the paper sets out to examine the official forecasts of air passenger growth and compares past forecast performance with outturns. An evaluation and assessment of the need for a drastic, modest or non-intervention policy is put forward.

June 20, Wed 9:25 - 10:25----Room: 110 ECC

Data Revision
Chair: Mathias Moerschm (UBS AG, UBS, Switzerland)

Optimal Tracking Of Data Revisions

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More than 1100 small, often rural telephone companies have a common set of wholesale rates that they charge long distance carriers to complete over their local networks. These companies pool their revenues and expenses and receive a common rate of return on investment. The National Exchange Carrier Association (NECA) administers this pool.
Companies in NECA's pool submit monthly revenue data. They have a right to revise a given month's data in the succeeding 24 months. As a result, predicting data revisions becomes a very important issue for calculating the pool's rate of return for a calendar year.
This paper explores the use of a variety of cross-section and time-series techniques to derive the best predictor of data revisions over a twenty-four month period. One technique of particular interest is a multi-step procedure that uses all reported data to predict the remaining revisions for data months that have not completed the twenty-four month window for data revisions. This technique will be compared to one where the months that are still potentially undergoing data revisions are chopped off from the historical sample.

Price Reactions To Macroeconomic Announcements - Do Revisions Matter?

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Recent event studies have established a strong link between the announcement of macroeconomic data and subsequent price adjustments in financial markets. Using tick-data from the years 1996 until 1999, we test the effect of 10 US announcements on the German bond market. In addition to evaluating the response of the surprise component of the announcement, we incorporate data

revisions of the same announcements into our estimates. The paper thus makes two contributions to the literature on announcement effects: First, it considers the international transmission of data releases and second it incorporates the role that data revisions play.

June 20, Wed 9:25 - 10:25----Room: 211 ECC

Marketing
Chair: Peter Gormley (Scottish Courage Brands Ltd., UK)

Measuring Dynamic Promotions Effects For Scanner Goods -- A Pooling Cross-Section Approach

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The paper focuses on the estimation of dynamic patterns of trade promotions. We discuss the shortcomings of using single distributed lag models for the dynamic pattern and propose a pooling distributed lag approach. It has been shown that the proposed approach improves estimates of model coefficients with correct signs and adequate quantities.

Keywords: trade promotion, distributed lag models

From Verbal Statements Of Market Evaluation To Graphic Display Of Price & Turnover

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A theory, a method, and a software implementation are presented, addressing the problem how to transform semantic information about the market into numerals expressing price, item turnover, and value turnover. The theory and the method are based on formalized judgmental ratings of the (psychometric) propensities to consume and to sell and estimations of the size of the consumers budgets, value-added tax, profit, deposit interest rate, and inflation rate. The software implementation yields a market prognosis spanning a year for nine different items on three different markets including market shares and allows a scaling of preset standard conditions to factual prices and turnover at the onset of the forecasting period.

Developing Model Based Forecasts And Pricing Policy In A Competitive Retail Environment

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Professor Robert Fildes, Acting Dean, President, Management School, Lancaster University, President of International Institute of Forecasters, Lancaster LA1 4YX, UK, Tel: 44 1524 - 593879, R.Fildes@Lancaster.ac.uk

Take home beer sales in the UK are increasingly driven by price and promotional activity. The market is highly competitive with a large number of brands vying for fewer but richer promotional slots. The challenge is to compete profitably whilst minimising availability issues. Scottish Courage Brands has worked with Lancaster University to develop its forecasting process in recent years to model the market and improve understanding of demand drivers. The presentation will cover the evolution and learnings from the initial exponential smoothing models, through regression models

of the beer market, to specific price elasticity and relativity models. It will cover the development of tools to aid both pricing decisions and forecasting of demand. The need for strong discipline to communicate changes in the market and to record assumptions adopted will be emphasised. There will be some discussion of how other businesses have tackled similar situations, and an outline of future plans within SCB.

June 20, Wed 9:25 - 10:25----Room: 109 ECC

Economic Forecasting
Chair: Marc Wildi (University of Fribourg, Switzerland)

About Model-Based Time Series Procedures: Some Remarks To TRAMO/SEATS And CENSUS X-12-ARIMA

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Model based approaches are commonly used in extracting signals of interest in time series which are buried in `noise'. In order to avoid boundary problems due to the usually preferred symmetric extraction filters (no phase-shift between filter-input and filter-output), finite data are extended by fore- and backcasts generated by a model of the series to be analyzed. Despite this the resulting filters may become heavily asymmetric. Moreover, different identification and/or estimation procedures may lead to different models resulting in different characteristics of the derived extraction filters. Therefore the question of `optimality' of these filters arises. Typical examples based on TRAMO/SEATS and X-12-ARIMA are presented, emphasizing on amplitude and time delay characteristics of the resulting boundary filters.

Keywords: revision error variance, model-mispecification, asymmetric extraction filters, amplitude and time delay functions.

Spectral Properties Of Linear Concurrent And Symmetric Seasonal Adjustment Filters Of SEATS And X-11/12-ARIMA For Short And Moderate-Length Time Series

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Donald E. K. Martin, Census Bureau and Howard University

In this paper we analyze frequency domain properties of some linear seasonal adjustment filters of X-12-ARIMA (and X-11-ARIMA) and SEATS for end point and central values of short and moderate-length spans of monthly time series data. The filters are those that arise when series are modeled with the Box and Jenkins airline model. The model parameters are varied to encompass a variety of degrees of flexibility of the seasonal and trend-cycle components.

Efficient Signal Estimation And Early Turning-Point Detection

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In order to avoid boundary problems due to the symmetry of signal extraction filters, finite data

sets are often Extended by fore- and backcasts generated from an estimated model (ARIMA). Unfortunately, this procedure is not optimal if the data generating process is unknown: optimization of model parameters with respect to some forecasting performance criterion is generally not equivalent with the minimization of the resulting signal approximation error. We propose to directly minimize an asymptotically best linear unbiased estimate of the variance of the signal approximation error. Furthermore, a more general constrained optimization enables earlier detection of turning points (of a trend signal). Comparisons with traditional model-based methods demonstrate the superiority of the proposed approach.

June 20, Wed 9:25 - 10:25----Room: 209 ECC

Judgemental - 2
Chair: Mary E. Thomson (Glasgow Caledonian Business School, UK)

The Asymmetric Characteristics Of Judgemental Confidence Intervals

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In forecasting a time series, one may be asked to communicate the likely distribution of the future actual value, often expressed as a confidence interval. Whilst the accuracy (calibration) of these intervals has dominated most studies to date, this paper is concerned with other possible characteristics of the intervals. It reports a study in which the prevalence and determinants of the symmetry of judgemental confidence intervals in time series forecasting is examined. Most prior work has assumed that this interval is symmetrically placed around the forecast. However, this study shows that people generally estimate asymmetric confidence intervals where the forecast is not the midpoint of the estimated interval. Many of these intervals are grossly asymmetric. Results show that the placement of the forecast in relation to the last actual value of a time series is a major determinant of the direction and size of the asymmetry.

Judgmental Forecasting Performance And Perceived Usefulness Of Forecasting Formats

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This paper explores the relationship between judgmental forecasting performance and perceived usefulness of various forecasting formats. While the point forecasts may be expected to be favored initially, the perceived usefulness of interval and directional predictions may be expected to increase after receiving performance feedback. To investigate these issues in a financial forecasting framework, an experiment is conducted in which participants are first asked to make predictions for 16 time series using point, interval, and directional probability forecasting formats. Forecasters are then requested to rank the usefulness of the four formats (i.e., point prediction, 50% prediction interval, 95% prediction interval, and probabilistic directional prediction). This is followed by the provision of individualized performance feedback to the forecasters, who are in turn asked to rank the usefulness of the various formats in hindsight. Findings are discussed and directions for future research are suggested.

Effects Of Trend Strength On Directional Probabilistic Forecasts

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This study compares the judgmental forecasting performance of experts and novices using simulated currency series with differing trend strengths. Elicited directional probability forecasts show significant effects of trend strength on predictive performance. Results reveal evidence for the hard-easy effect where overconfidence is exhibited on weak (i.e., more difficult) trends, while underconfidence is shown on strong (i.e., less difficult) trends. Reflecting experts' resistance to strong trends, lower performance of experts on relative accuracy and profitability measures are reported for such series. Overall performance is also found
to be superior for negative trends. Possible explanations are offered for these results and future research directions are outlined.

June 20, Wed 10:40 - 12:00----Room: Willow (ACME)

Revenue Management
Chair: Mary McShane Vaughn (Manugistics, Atlanta, GA, USA)

Forecasting In Revenue Management

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This presentation will introduce to the ISF audience the application area of forecasting in Revenue Management, with particular focus on airline Revenue Management. The speaker will give an overview of the business processes associated with the booking of airline tickets; the systems by which the sale of seats is controlled; the purpose of a Revenue Management System (RMS), and the role of the forecasting subsystem within it. The speaker will discuss unconstraining, the 2-dimensional temporal nature of the Revenue Management forecasting problem, and some typical forecasting heuristics used within RMSs. The presentation will finish with a discussion of topics of current interest within the Revenue Management industry such as O&D forecasting, passenger choice issues such as recapture and buy-up/sell-up, and other topics.

Aggregating Forecasts or Forecasting Aggregates

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Forecasters often wish to model a time series that is actually an aggregate of other time series (e.g. total demand from multiple products, weekly demand from daily demand, regional demand from local demand, etc.). Certainly, the choice of forecasting technique or model is a major consideration. There is also another critical issue: whether better prediction performance can be achieved by directly forecasting the aggregated time series (direct forecast) or by summing the forecasts of the lower level time series (bottom up forecast). This talk will address the aggregation issue and present examples from actual business applications.

June 20, Wed 10:40 - 12:00----Room: Peach (ACME)

Forecast Management - 2
Chair: Charles Kaplan (MetrixPoint, Rockville, MD, USA)

Are Forecasting Skills Transferable From One Discipline To Another?

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An interesting question is whether forecasting skills are transferable from one discipline to another. Can forecasters apply the forecasting techniques with which they are familiar to a new set of problems? How accurate are the forecasts of individuals who are not specialists in a particular area? We have an interesting set of forecasts that might provide some insights into this issue. These data come from the forecasting contests that were conducted in conjunction with the US Federal Forecasters Conference 1992-97. Using the weather and commodity price forecasts from these contests we determine: (1) How many forecasters were more accurate (absolute size of the error) than the naive prediction, that is, a prediction made with minimal readily available knowledge and generally available forecasting techniques? (2) Can one explain why the forecasters did not make the naive prediction? Here we present our methodology and address these questions.

Using Business Forecasting To Evaluate The Companies

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Dr. Emese Molnár, senior lecturer, University of Miskolc, Hungary

First we define the problems. In the nineties in Hungary there were a lot of new enterprises. Some of them work well in nowadays, others disappeared. What is the reason that the judgement of one company is different than the other? The companies can't work without the effective executive system, which coordinates the company processes. The management has to know their corporate value beside the normal tasks. This is the valuation of the company. The effectiveness depends on the conditions used and forecasting. This paper emphasizes the most important problems of the forecasting in Hungary. E.g. which characteristics are for the prices, how to get reliable information of these variables, how to supply the forecasters with the required information about these areas and the future changes. Secondly we show the possible methods and the results of the forecasts.

Forecasting And Managing Service Revenue With A Structural Model

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The business problem here is to set annual revenue objectives for the component segments of a line of corporate calling card service and to track and manage business performance as the year progresses. A standard approach would be to use monthly revenue history to forecast monthly revenue 12 months ahead and then allocate to the segments. However, this approach does not help the manager of the line to explain what is wrong and to propose remedies when revenue comes up short. An alternative we found more useful is to build a structural model of the revenue

generation mechanism, where we identify a chain of drivers such as number of cards provisioned, distribution of time to first use, probability of repeat use, minutes of use per user, revenue per minute, that impact revenue finally. With this approach, it is more natural to go bottom-up - build models for the segments then aggregate to a model for the whole line. The drivers themselves, are often business metrics that managers can do something about or at least believe so. The "passive" forecasting exercise thus becomes a more pro-active what-if analysis where managers can examine consequences of many different scenarios or even set the drivers to achieve desired revenue objective. The structural model also makes the statistician's life easier as it makes it harder for fast talking managers to argue against the results especially their revenue objectives. SPLUS was used to implement the model but it could be implemented via a spreadsheet program like EXCEL as well.

Sales Force Data - an Untapped Resource

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In today's economy, high velocity companies must grow at a rapid rate, while accurately predicting their future performance. Missing "the numbers" by even a small percentage can cause tremendous swings in company value, literally overnight. The only way a company can meet the demands of predictable growth, quarter over quarter is by aligning the whole organization behind the same assumptions, and the same driving metrics. In many organizations, the sales force is the group closest to the customer, and the one with the most information about future demand. Unfortunately, the information that they have is often discounted, or overlooked in the forecasting process. More importantly, they are often completely disconnected from the company's planning processes. There are numerous enterprise applications to help increase the productivity of a sales force. Some of these applications collect information about future demand. These applications, however, are not designed to gather data that can be validated and integrated with a companies forecasting process. What's needed is a process that gathers demand information from a sales force, allows that data to be "scrubbed" or validated, and finally reconciled with actual performance. This creates an "accountable" process that can be integrated with the company planning process, and one that ameliorates the longstanding concern that data from the sales force is not accurate. Companies that implement processes and applications for including measurable sales data into their forecasts, and focus on strategies that will enhance that data by reconciling it with actual results, will achieve a competitive advantage as they lead the way into a new and powerful paradigm for business planning.

June 20, Wed 10:40 - 12:00----Room: 110 ECC

Econ Topics
Chair: Charles L. Evans (Federal Reserve Bank of Chicago, IL, USA)

Testing For Stochastic Nonlinearity In Rational Expectations Permanent Income Hypothesis

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The Rational Expectations Permanent Income Hypothesis implies that consumption follows a martingale. However, most empirical tests have rejected the hypothesis. Those empirical tests are based on linear models. If the data generating process is non-linear, conventional tests may not assess some of the randomness properly. As a result, inference based on conventional tests of

linear models can be misleading.
This paper tests for the presence of stochastic non-linearity in aggregate consumption of non-durable goods and services, using US and Canadian data. The two major tests applied are a test devised by Brock, Dechert, and Scheinkman, and a test based on an Artificial Neural Network model. The results support the hypothesis that there is no non-linearity in the data. The forecast results, however, suggest that even though linearity is not rejected, the non-linear ANN model tends to outperform the linear ARIMA model over three different horizons. Key words: Non-linear dynamic, Rational Expectations Permanent Income Hypothesis, BDS test, ANN test.

Forecasting Aggregate Trade Flows: Comparing The Performance Of Time Series And Econometric Models

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We compare the out-of-sample forecasting performance of several time series and econometric models. Our dataset contains monthly, aggregate trade flows from Turkey, covering the period 1969-2000. We evaluate forecasting performance using a rolling sample and both descriptive measures, like root mean-squared errors, and formal statistical tests. Our results indicate that, most of the time, simple time series models can outperform the more elaborate econometric models. This finding is useful in applied policy forecasting since good forecasts should precede the implementation and monitoring of economic policies.

Keywords: out-of-sample forecasting, time series models, econometric models, aggregate trade flows, rolling sample.

Business Cycle Dating And The Chicago Fed National Activity Index

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On March 5, 2001, the Federal Reserve Bank of Chicago began releasing a new monthly index designed to better gauge overall economic activity and signal future inflationary pressures. The new index is called the Chicago Fed National Activity Index, or CFNAI. Using principal component analysis, the index measures a
single factor which is common across 85 monthly economic activity indicators. The index provides a useful summary of coincident economic activity and helps predict future inflationary pressures. More information on the CFNAI is available at http://www.chicagofed.org. The activity index closely tracks business cycle expansions and recessions. For example, over the period 1967-2000, the CFNAI has fallen below -0.7 on six occasions, with five of these corresponding to the onset of a recession. How reliable is this 83% success rate, considering the small number of observed business cycles since 1967? This paper describes simple methods for estimating an underlying dynamic factor structure for 85 economic indicators so that this question can be addressed using monte carlo methods.

June 20, Wed 10:40 - 12:00----Room: 211 ECC

GDP - 2
Chair: Moreno Roma (European Central Bank, Germany)

Policy Making and Forecasting with a Pesaran-Type Core Model of the Trinidad & Tobago Economy

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This principal objective of this paper is the construction and evaluation of a Pesaran-type core quarterly econometric model of the Trinidad and Tobago economy using data covering the period 1970-1998. It represents the first step in the construction of a more comprehensive model of the Trinidad & Tobago economy with this core at the centre. Such a model will be used for forecasting and for policy evaluation.
In the paper, the econometric methodology to be employed is presented and discussed. This is followed by a description of the hypothesized long run relations in the core model which are derived from economic theory as well a discussion about the associated problems relating to the corresponding data to be used. The core model is estimated after testing for unit roots and cointegration vectors. The Error Correction form of the model is then derived and evaluated. Persistence profiles based on system wide shocks are derived and discussed. Forecasts derived from the model are compared to those obtained from benchmark ARIMA models.

Keywords: Core model, long run relations, cointegration, persistence profiles.

A Leading Index For India's Exports

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This paper presents a method for predicting cyclical downturns and upturns in Indian exports using the 36 country real effective exchange rate and leading indices of major trading partners. These leading indices are developed at the Economic Cycle Research Institute and forecast the onset and end of recessions in overall economic activity in these economies. The results show that the new leading index of Indian exports (in level and growth form) would have anticipated most of the cyclical turns in real exports, the price of exports, and their value over the past 25 years.

Aggregate Vs Disaggregate Forecasts In Macroeconomic Modeling: The Manufacturing Sector For Poland

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Constructing models to forecast the performance of emerging economies is a challenging undertaking. Even prior to the thought of model development is the issue of adequate data series. For the case of Poland in particular, sectoral model development is continually becoming more plausible. When constructing a
forecasting model for an aggregate sector of the economy for which disaggregated subsector data exist, a relevant issue is the method of obtaining the aggregate sector forecast. Should the aggregate forecast be obtained by summation of disaggregate forecasts generated from individual subsector models, or should the subsectors initially be aggregated and a forecasting model developed based on this aggregate? We explore this in detail for 21 manufacturing subsectors of the Polish economy which, when combined, comprise an aggregate manufacturing sector. We

derive forecasts using the naive no-change method, a Holt-Winters model, and a simple econometric model. We focus on the quality of the data, explore the possibility of loss of information that may result from aggregation, and construct a test statistic that permits comparison of the single aggregate forecast with the set of disaggregate forecasts.

Can Confidence Indicators Be Useful To Predict Short Term Real Gdp Growth?

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The objective of this paper is to show that, in general, confidence indicators can be helpful in predicting economic activity in the short run. We first briefly review the main uses of confidence indicators, namely predicting turning points and making forecast. Subsequently, we build a short-term GDP forecast model for six euro area countries (Germany, France, Italy, Spain, the Netherlands and Belgium) using confidence indicators, namely the European Commission Industrial and Consumer Confidence Indicators, and the Economic Sentiment Indicator. In each country, the relation between real GDP and confidence indicators is supposed to vary over time and is estimated with the Kalman filter technique. All the estimated models have good in-sample properties. Regarding the out-of-sample properties, we compare the forecast performance of the estimated model with a GDP ARIMA model used as a benchmark. To compare the alternative models, we produce one step forecasts using a rolling sample estimation. To complete the analysis, we implement the Diebold-Mariano test to check the accuracy of alternative forecast models. We find that in general the models we estimate perform better than a simple ARIMA model. Moreover, as is common in the literature, the quality of the estimates differs among countries. In particular, better results were found for Germany, Italy, Belgium and to a lesser extent France and Spain and less satisfactory results for the Netherlands. These results still hold when the models are supplemented with a lagged dependent variable or with the index of industrial production.

Keywords: Forecasting, Confidence Indicators, Kalman Filter
JEL Classification: C22, E27

June 20, Wed 10:40 - 12:00----Room: 112 ECC

Govt: Education and Health
Chair: Gary Coil (CDC, Atlanta, GA, USA)

Designing Forecasts Of Medicaid Expenditures And Persons Served

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Medicaid has limited short term control over enrollment and utilization, and only some control over prices paid for services. How can Medicaid expenditures be effectively forecast? The key is disaggregation. Medicaid is composed of multiple groups of different populations. Breaking out groups by major distinguishing factors - differences in either the average price per group, prices changing over time at different rates, or group numbers growing at different rates - are critical. After groups are selected, the number of persons is reviewed distinctly from the average cost per person
per month. Adjustments to each set of data are made to explain specific variations in the data.

Several adjustments or exclusions from the data are made. The adjustments are generally made to deal with specific outlier situations, and the exclusions are made for data that is different from the basic expenditure data. Distinct and simplified forecasts are made for the exclusions as they have less variation. The remaining data is forecast for each population using Exponential Smoothing, ARIMA, and regression. Any one or combination of these may be selected based upon past experience. Regression forecasts are based primarily upon using modified statistical quality control techniques to identify potential variables. While this involves a certain amount of subjectivity, the results of this approach have been promising.

Modelling The Effects Of Socio-Economic, Geographic And Behavioural Factors On Road Traffic Casualty Rates In Scotland.

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Road Traffic accidents (RTAs) are a major contributor to morbidity and mortality in developed countries. Over 4,400 people were killed or seriously injured on Scotland's roads in 1998, of which almost 700 were children aged 0-15. Research indicates that socio-economic status is an important factor in determining casualty rates, particularly for vulnerable road-user groups such as child pedestrians. Evidence suggests that children from the most deprived areas are approximately 6 times more likely to become a pedestrian casualty than their most affluent counterparts. The Scottish Driver Survey was carried out across the whole of Scotland in 2000 to investigate why differences in casualty rates exist on a geographic basis. Differences are caused by variation in population structure, traffic volumes, road infrastructure and behavioral factors. Similarly, perceptions of road safety issues, risk factors and the effects of transport policy also vary by area. From this information a predictive model is developed which will allow policy makers to determine the effects of a variety of interventions. Some of the scenarios investigated will be demonstrated.

Keywords: road safety, regression, policy appraisal

Forecasting National And State Vaccine Need And Cost - A Population-Based Forecasting Application

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Background: The National Immunization Program has used a variety of vaccine forecasting methods to support funding allocation decisions. Prior methods relied on vaccine purchase data and have been poor predictors of true vaccine need, resulting in funding inequities.
Objectives: To develop an automated, user-friendly, easily maintained vaccine forecasting model, which accurately forecasts single and combination vaccine need and cost at both the state and national level.
Methods: Design a spreadsheet-based forecasting model employing a matrix of US Census population estimates and vaccines available through the CDC contract. Default to ACIP-recommended doses by age. Adjust estimates of need by: 1.) the proportion of the population receiving publicly-funded vaccine (Population Estimates Survey data); 2.) current inventory by brand; 3.) desired inventory; 4.) estimates of wastage/loss by vaccine type. Provide for the proportional allocation of funds for each vaccine type.
Results: A population-based forecasting model is being beta tested. It provides a standardized methodology for forecasting vaccine need and cost based on a program's operational characteristics, immunization goals, and the population served. Inputting: 1.) ACIP recommendations; 2.) an estimate of 66% of the US population 0-18 years of age served with publicly-purchased vaccines; 3.) vaccine prices on the CDC contract as of 10-01-2000; 4.) a

vaccine loss/wastage rate of 5%; and 5.) a "static" inventory, the model forecasts a CY 2001 public sector vaccine need of 63.4 million doses at a cost of $1.07 billion dollars.
Conclusions: The vaccine forecasting model can accurately model population-based vaccine need and cost dynamically, using a standardized methodology and currently available data sources. It provides real-time scenario modelling capability for programs requiring evidence-based support for their annual funding requests for immunization initiatives.

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Judgemental - 3
Chair: Nada R. Sanders (Wright State University, Ohio, USA)

Structural Qualitative Method Of Forecasting

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Quantitative methods available for forecasting such as time series and causal models require a large amount of tangible data and often need to be fine tuned based on the qualitative information on important variables. In addition, special expertise required for these techniques becomes a major constraint for many organizations especially in developing countries in using them. Qualitative methods available are either heavily expert oriented or too subjective. There are difficulties in using expert oriented methods on a regular basis by business organizations unless they are generated internally. Methods that are too subjective do not generate feedback information to fine tune them so as to generate more accurate forecasts in the future. We have developed a new forecasting method, Structural Qualitative Method, which overcomes the problems of these conventional methods. The method requires developing a structure for a given forecasting situation both at the industry and company level and uses subjective judgements on various factors with respect to their importance and conditions. It uses qualitative and quantitative information through a systematic analysis of the information. The method uses the data that are available with the forecaster and can generate different types of forecasts with respect to time, space and form. The method can be used by sales force as well as executives to generate forecasts and update them as and when an additional piece of information is available. Its ability to generate forecast at various amount data availability and its simplicity in repetitive use makes it well suited for business organization in developing countries. We used it for seed and pesticide companies in India and found it to be a very useful method.

Tracing The Process Of Using A Forecasting Support System

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The actions of individual users of an experimental sales forecasting support system were traced and analyzed. The analysis revealed that users adopted a wide variety of strategies when choosing a statistical forecasting method and deciding whether to apply a judgmental adjustment to its forecast. This was the case despite the users reporting similar levels of familiarity with statistical methods. In general, the study found that users did not emulate mechanical forecasting systems in that they often did not choose the forecasting method that provided the best fit to past data. They

also tended to examine only a small number of methods before making a selection, though they were likely to examine more methods when they perceived the series to be difficult to model. Individuals who were relatively unsuccessful in identifying a well fitting statistical method tended to compensate for this by making large judgmental adjustments to the statistical forecasts. However, this generally led to forecasts that were less accurate than those produced by people who selected well fitting methods in the first place. Nevertheless, individual users were very consistent in the strategies that they applied across twenty different series. This suggests that forecasting support systems may be able to detect weaknesses of users' strategies at an early stage and tailor the nature of the support provided to address these individual needs.

An Analysis of the Benefits Of Scenario Planning: Lessons From Consultancy Practice

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This paper contributes to the critical discussion of external agents to change and development programs. We present evidence of externally-facilitated change to mindsets and patterns of behavior within local government through use of a scenario planning based approach. Our case analysis supports the use of scenario planning as a tool for establishing the limits of possibility and plausibility for " the future", understanding the perceived causal relationships, and exploring the limits of critical uncertainties within the external environment prior to determination of options. As such, scenario planning is a process-orientated tool that promotes dissenting opinion, encourages divergent thinking, and does not apply selection and exclusion in search of a single best solution. Rather, it provides a means of generating shared, causally generated, understanding of plausible futures - some of which may be unfavorable to the organization and its current strategic intent. This maintenance of divergence of opinion, belief, and perception - within an overall unifying frame of limits of possibility - is in contrast to the reductionist unity of both (i) quantitative forecasting approaches and (ii) decision analysis. It also contrasts with the fragmentation of unstructured group-based judgments.

Toward Understanding Business Forecasting: Survey Findings And Insights

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We report results of a survey of over 2300 US corporations designed to increase understanding of organizational forecasting practices and profile differences between firms with primarily reliance on judgmental versus quantitative forecasting methods. Results show that companies continue to rely on judgmental methods, with no increase in usage level of quantitative methods. Integration of judgmental and quantitative forecasts appears to be used extensively, confirming this to be a prevalent business practice. Findings on the process of organizational forecasting reveal high priority given to reaching consensus, low reliance on consultants to generate forecasts, and an increased use of IT in gathering relevant information. Firms primarily relying on quantitative methods are found to operate in an environment with lower uncertainty, have greater access to objective information, and place greater reliance on objective factors. Inaccurate forecasts are found to be a significant challenge for seventy percent of firms relying on judgmental methods, compared to only 30% of firms relying on quantitative methods.

Keywords: Forecasting practice, Level of usage, Combining forecasting, Subjective forecasting, Objective forecasting methods.

June 20, Wed 10:40 - 12:00----Room: 210 ECC

Environment Applications
Chair: Gutemberg H. Brasil (Universidade Federal do Espírito Santo, Brazil)

Using Jeffrey's Prior Distribution In Bilinear Time Series Analysis: Case Study On Sg. Pahang, Malaysia Water Level

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The bayesian inferences in time series only started by Zellner (1971) and Box and Jenkin (1976). A study on Bayesian approach started with its application on linear model which can be extended to include linear time series model such as the autoregressive model, for example, refer Monahan (1983) and Broemeling (1985). Winkler (1980) discusses the prior and predictive distribution through bayesian model-building at length. These ideas is possible to be extended to nonlinear time series. One of them is the bilinear model. As for this paper, we follow closely the method used by Chen (1992). The prior distribution uses the Jeffrey's prior distribution as set out by Jeffrey(1939). It is shown that the resulting posterior distribution is normal-gamma. Thus, the hyperparemeters estimates of posterior distribution can be obtained easily. Researchers believes that the non-linear hydrological and climatological data is better fit by bilinear model. For that, a numerical treatment on water level data collected from Sg. Pahang, Malaysia will be discussed in this paper.

Rainfall In Fortaleza, Brazil: A Reanalysis

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In time series literature, the annual rainfall series of Fortaleza, located in northeast Brazil; an area marked by low level of precipitation, has been thoroughly analyzed particularly after 1980 when a great number of articles have been published. The majority of these articles are related to conjectures on the cyclical behavior of the series. On the other hand, in the last 20 years we have observed a series of climatic variations with unexpected intensities, particularly those related to the welknown phenomena ^ÓEl Niño^Ô and ^ÓLa Niña^Ô. In this paper we reanalyze the Fortaleza rainfall data aiming the detection of possible changes in the cycles already estimated in previous analysis. Bayesian and Classical approaches to model unobserved components are used in the study.

Keywords: Cycles, Time Series, Forecasting, Structural Modes, Rainfall data

Prediction Of Diameter Distribution Models For Simulation Of Acacia Mangium Plantations
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A procedure for predicting diameter distribution of Acacia mangium plantations was developed based on the univariate SB distribution model. In simulation of stand characteristics, equations were developed for predicting average height, basal area per hectare, and number of trees per hectare surviving when age, spacing and number of trees per hectare planted were known. The predicted stand characteristics were then related to the estimated parameters of the Johnson SB and solving the resulting set of equations for the scale and shape parameters. This study revealed that the parameter prediction method yields reliable prediction equations of the stand characteristics, but the prediction equations of the scale and shape parameters suggested that further research is needed to improve the model.

Keywords: diameter distribution, parameter prediction model, probability density function, regression equations, stand characteristics.

Poster Session

The New Information Technology: The End Of National Identity?

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At the brink of a new age in communication, many hold optimistic views for the future. New Information Technology, particularly the Internet is believed to bring about the formation of a global network society resulting in ultimate democracy (free access to information and knowledge to all). Many forecast that this global network society will be the end of the nation-states, as we know it. Yet many of these forecasts focus on the effects of the global network economy on the sovereignty of the nation-state but do not take into account the impact of this technology on national identity and how national identity in turn could have an impact on the uses of this new information technology.

It has been argued that the Internet blurs cultural and national distinctions as it overloads us with information, creating a pressure to assimilate into a larger global society. Many contend that a nation-state's ability to maintain the collective national identity is possible only in an analog media system. Since digital technology allows infinite, costless reproduction and production of the official culture, the nation-state looses the control of sustaining and monitoring itself.

Despite the forecasts of network economy and network society bringing everybody together, one needs to see that the Internet as a universal force makes nationalism to be expressed easier for nation-states and for nations without states. These forecasts of network economy and network society discount the resiliency of national identity, similar to the way that technologically deterministic forecasts of the individual have discounted human nature, and have overlooked that people deploy technology and create its social meanings. The forecasts of network economy and network society assume that nations will not simply use the medium to assert their identity in other forms. This paper argues that, as national distinctiveness is blurred, nationalist impulses will profess themselves and people will seek to reclaim the sovereignty of their nation and thus their national identity, and will deploy this new technology for those means.

Classic And Bayesian Modeling: Empirical Evidence Of The Brazilian Inflation

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This paper attempts to shed light on the problems of the Brazilian inflation which has been ever increasing since the 1970's. A statistical test is proposed that demonstrates the non-homogeneity of the time-series data involved in the study. Homogeneity is achieved by dividing the data into two distinct periods, before and after December of 1979. It is shown that at and around this date a several structural change occurred in the economy. These two periods are then analyzed as to the major determinants of inflation. These determinants are not the same for the two periods. Besides the statistical test proposed here, other techniques are used, such as transfer function models and Bayesian methods, to analyze the causal relationships behind Brazilian inflation.

Statistical Process Control Via Times Series

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Technological development has reduced the variability items produced on large scale. Today a small change in the process can be critical, requiring rapid action to eliminate it. Traditionally, control charts are used to distinguish between the common causes of variation and the assignable causes of variation, to process generating independent and identically distributed random variables. In this paper the ARIMA models to monitoring serially correlated data have been proposed. The results are then compared with those from traditional techniques: Classical Shewhart control charts and Cumulative Sum Method (CUSUM). The expected number and the expected time for some real and simulated series has been analyzed as well as the verification of relative efficiency between the methods.

Using Technology Publication Database Metrics as Indicators of Market Behavior: Lesson Learned

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In recent years, many technology managers have begun to use indicators from science and technology publication databases to aid them in the decision-making process. Many of these indicators have been developed by observation, through project experience, yet very little research has been done to validate the information provided by these indicators. The basis of this paper is a research project that I conducted in order to 1) determine if publication metrics currently utilized provide a direct link to market behavior 2) discover new publication metrics that may have a link to market behavior and 3) initiate discussion on future research concerning mining publications for market indicators. Due to time, the availability of data, and the exploratory nature of the research, the approach was a case study of two technologies: Asynchronous Transfer Mode and

Microelectromechanical Devices. The focus of this paper is not the actual study results, but more importantly, the lessons learned about what does and does not constitute a valid hypothesis about the information provided in publication metrics, and the identification of areas for future research and discussion.

Forecast Quality Based On Random-Set Theory And Set-Valued Statistics

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The objective of the paper is to introduce an alternative measure to the Mean Squared Error for the quality of a model. Random-set theory is used for the extraction of information from a sample of data. A sample of random subsets is obtained from the statistical features of groups of nearest neighbors. We study the particular case where the random subsets are quartile ellipsoids of probability equal to 1 generated by the covariance matrix of groups of nearest neighbors in the state space. The principal aim of this is to include the uncertainty that the experiment or process under study may have. Thus, the uncertainty is explained locally by the random subsets, i.e. a group of nearest neighbors describes a local region of uncertainty by their statistical features which may be different to other group of neighbors placed at different position in the state space. All this information is combined and summarized by the one-point coverage function of the random-set that generates the random subset sample. This function defines a possibility distribution or fuzzy restriction in the state space which indicates the degree of feasibility for each of the possible states of the process respect to the experience. Unlike classical statistics which deals with samples of data points, set-valued statistics are required to treat a sample of random subsets in order to obtain an estimator of the one-point coverage function. The conditional one-point coverage function with respect to a fixed input data point generates a possibility distribution from the output space to the [0,1] interval indicating the degree of feasibility of any output conditioned on the a specific input. On the other hand, for a forecast calculated for any model, for an input data, the conditioned possibility indicates its degree of feasibility as an outcome of the process under study. The combination of these values for a group of forecasts provides the model quality measure we describe in this paper.

A Methodology for Technology Identification, Evaluation, and Selection in Conceptual and Preliminary Aircraft Design

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The changing global socio-economical and political environment is creating a paradigm shift in the aerospace industry. This paradigm shift calls for solutions that are beyond evolutionary databases and demands consideration of all aspects of the system's life cycle. The shift implies that a new means of evaluating the "goodness" of a system must be established and requires inclusion of three elements. The elements are as follows: consideration of the product life cycle in the early phases of design, new design methods to account for multiple criteria and uncertainty, and breakthrough technologies to meet aggressive performance and economic objectives of the future. A new design method for complex systems was created as a response to the paradigm shift and was achieved with the use of statistical and probabilistic methods, including Response Surface Methods and Monte Carlo Simulations. The method accounts for the multi-criteria problem in the presence of design, operational, and technological uncertainty while allowing for the infusion and subsequent affordability assessment of immature technologies. The design method includes a forecasting environment whereby the decision-maker has the ability to easily assess and trade-off the impact of various technologies without sophisticated and time-consuming mathematical

formulations. This objective was achieved by employing the use of Morphological analysis, forecasting analogies and techniques, and Multi-Attribute Decision Making techniques. Through the execution of the method, a family of design alternatives for a set of customer requirements can be identified and assessed subjectively or objectively. This method allows for increased knowledge, reduced committed costs and increased design freedom leverage to produce high quality and competitive cost systems in a systematic and comprehensive manner and is called the Technology Identification, Evaluation, and Selection, or TIES, method. The TIES method was demonstrated on a High Speed Civil Transport concept. This vehicle was chosen as a benchmark for the method due to the technically challenging customer requirements and the need for revolutionary advances over present day technological capabilities to obtain feasible configurations. The TIES method established the need and the product specifications and identified the most suitable set of technologies to satisfy all customer requirements in a probabilistic design setting.

Use Of The Nsrl Family Of Substitution Curves To Model Incremental And Discontinuous Technology Replacement

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Substitution curves model the growth of emerging technologies as they replace older technologies in a fixed market. Substitution after discontinuous change, where adopters tend to abandon their old products before such products have broken or worn out, is often best modeled using the Fisher-Pry curve. Substitution after small incremental changes in technology, where adopters delay abandoning old products
until such products wear out, is usually well modeled by the Gompertz substitution curve. The exponential substitution curve is normally appropriate in the case of incremental change where adopters delay abandoning old products which normally are accidentally broken or lost before they wear out. The exponential curve and Fisher-Pry curve can be considered end members of the NSRL family of curves which model a range of substitution processes which are neither fully discontinuous nor simple incremental changes. The Gompertz curve is well approximated by an intermediate member of this curve family. The NSRL model, developed by Easingwood, Mahajan and Muller, is intuitive and parsimonious, having three parameters: the rate constant, the market size, and an exponent. Normalizing the model by both rate constant and market size allows graphical depiction of the members to illustrate the relationship between the model exponent, curve shape, inflection point, delay in growth and asymptotic behavior. Members of this family of curves behave differently at early phases of substitution but all curves approach the same asymptotic limit during the later phase of the substitution process.

Predicting Body Fatness From Physical Activity Measurements

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The prevalence of obesity among children in Western countries has increased in the last decade. Results of population studies suggest that this recent secular trend may be due, at least in part, to a reduction in the level of physical activity, rather than an increased intake of energy or fat. The current study aimed to measure physical activity level in 35 children aged 6 to 9 years by three different methods and to determine whether any of the physical activity indices related to body fatness. Physical activity was measured by an activity monitor (the Tritrac-R3D accelerometer) which records movement in three dimensions every minute; a three day activity diary which recorded activity category (ranging from 1 for bed rest to 7 intense competitive sport) for each 15

minute period throughout the day; and a questionnaire about lifestyle factors (including information on type of transport to and from school, fidgeting level, TV viewing, time spent in different sports). Stepwise multiple regression analysis was used to develop models to predict percent body fat. Results suggest that the activity diary is the best predictor of percent body fat. The activity diary is inexpensive and relatively easy for parents to complete. It may be an important tool to identify those children with low activity levels who may be at risk of becoming overweight. These children could then be targeted for school-based intervention programs for the prevention of obesity.

Box & Jenkins Models Applied For Identification And Analysis Of Stourist Flow

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The present paper defines as area of interest the northwest of the state of RS, that includes three ports between Brazil and Argentina, where the smoothing was accomplished Box & Jenkins. The objective of the smoothing is to describe the behavior of the representative series of the number of people that indeed accomplish the crossing in Porto Vera Cruz / Panambi, comparing it with the series studied in the ports, Porto Xavier / San Javier and Porto Mauá / Alba Posse. The data were collected through the consultation to documents organization of control of the people's flow, in existent cadastrer organs, such as Federal Revenue, in a first instant without the authorization of opening of the ports in Sundays and Holidays and in a second instant with the authorization of the opening of the ports in Sundays and Holidays. After the graphic analysis of the data applied the methodology Box & Jenkins, which gave us the representative equation of the same ones. After having found the representative equation of the data, we made the short term of the number of people forecast that indeed accomplish the crossing in the ports in study. It can be verified that after the opening of the ports in the week ends there was a considerable variation, which is confirmed by the average done before with the data and after the opening. The calculated forecasts can be used in the plans of economic viability.

Keywords: Time Series; Box & Jenkins; Forecasting

Automating Technology Forecasting

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To be useful, forecasts must be provided when needed to inform decision-making. This presentation describes our efforts to semi-automate the analysis of particular emerging technologies to provide "real time technology forecasts." Our process entails search and retrieval of information concerning a technology of interest from several electronic information resources (databases and internet sites). We then clean and consolidate the data. We follow by analyzing the data so as to provide answers to 16 questions concerning emerging technologies. These are oriented toward "innovation indicators" - interpretable measures pertaining to the maturation processes. Then we represent the findings for website dissemination. We describe the development of data structures and scripted processes to populate a website on "HotTech" [http://tpac.gatech.edu]. The analyses entail orchestrated use of multiple programs - VantagePoint, MS Excel, MS Word, and Adobe Acrobat (pdf files). We show the steps in generating a technology forecast on one topic, "information security."