

# Program

The 16th

# Federal Forecasters Conference 2008

**Health Care Forecasting: Informing Future Choices**  
**April 24, 2008**  
**at the Bureau of Labor Statistics**

## **Sponsoring Agencies**

Bureau of Labor Statistics  
Bureau of Transportation Statistics  
Department of Veterans Affairs  
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## **Partnering Organization**

Center for Economic Research, The George Washington University

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FFC/2008

***The 16th  
Federal Forecasters Conference***

**April 24, 2008**

**Health Care Forecasting: Informing Future Choices**

Bureau of Labor Statistics (BLS) Conference and Training Center  
2 Massachusetts Avenue N.E.  
Washington, DC

SPONSORING AGENCIES

- Bureau of Labor Statistics • Bureau of Transportation Statistics
- Department of Veterans Affairs • Economic Research Service • Internal Revenue Service
- International Trade Administration • National Center for Education Statistics
- U.S. Census Bureau • U.S. Geological Survey • U.S. Postal Service

PARTNERING ORGANIZATION

Center for Economic Research, The George Washington University



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## 2008 Federal Forecasters Consortium Organizing Board

**Busse, Jeff**

U.S. Geological Survey  
U.S. Department of the Interior

**Byun, Kathryn**

Bureau of Labor Statistics  
U.S. Department of Labor

**Chu, Michelle**

Internal Revenue Service  
U.S. Department of the Treasury

**Fernández, Leticia**

U.S. Census Bureau  
U.S. Department of Commerce

**Figueroa, Eric**

Bureau of Labor Statistics  
U.S. Department of Labor

**Henry, Eric**

Internal Revenue Service  
U.S. Department of the Treasury

**Hussar, William**

National Center for Education Statistics  
U.S. Department of Education

**Irazi, Caribert**

U.S. Census Bureau  
U.S. Department of Commerce

**Joutz, Frederick**

Center for Economic Research  
The George Washington University

**Kingkade, Ward**

U.S. Census Bureau  
U.S. Department of Commerce

**Kori, Vidya**

International Trade Administration  
U.S. Department of Commerce

**MacDonald, Stephen**

Economic Research Service  
U.S. Department of Agriculture

**Matthews, Marybeth**

Veterans Health Administration  
U.S. Department of Veterans Affairs

**Singh, Dilpreet**

Veterans Health Administration  
U.S. Department of Veterans Affairs

**Sloboda, Brian W.**

Pricing and Classification  
U.S. Postal Service

**Sorensen, Kathleen**

National Cemetery Administration  
U.S. Department of Veterans Affairs

**Weidman, Pheny**

Bureau of Transportation Statistics  
U.S. Department of Transportation

**Woods, Rose**

Bureau of Labor Statistics  
U.S. Department of Labor



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## Conference At A Glance

### Morning Session

8:00 a.m. – 11:30 a.m.

8:00 a.m. – 9:00 a.m.	<b>Registration</b> Lobby
9:00 a.m. – 9:05 a.m.	<b>Opening Remarks</b>
9:05 a.m. – 9:10 a.m.	<b>Welcome</b>
9:10 a.m. – 9:20 a.m.	<b>Award Announcements</b>
9:20 a.m. – 11:30 a.m.	<b>Panel Discussion*</b>
11:30 a.m. – 11:40 a.m.	<b>Award Presentations and Photographs</b>
11:30 a.m. – 1:00 p.m.	<b>Lunch (On Your Own)</b>

### Afternoon Concurrent Sessions

1:00 p.m. – 4:15 p.m.

1:00 p.m. – 2:30 p.m.	<b>Concurrent Session I</b>
2:30 p.m. – 2:45 p.m.	<b>Afternoon Break</b>
2:45 p.m. – 4:15 p.m.	<b>Concurrent Session II</b>

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\* There will be a break after the first two panelists



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**Room 1 ..... 9:00 a.m. – 11:30 a.m.**

## **Morning Session**

9:00 a.m. – 9:05 a.m.                      **Opening Remarks**

Eric Figueroa  
Chair, Federal Forecasters Consortium  
Bureau of Labor Statistics  
U.S. Department of Labor

9:05 a.m. – 9:10 a.m.                      **Welcome**

Keith Hall  
Commissioner  
Bureau of Labor Statistics  
U.S. Department of Labor

9:10 a.m. – 9:20 a.m.                      **Award Announcements**

### **FFC/2008 Forecasting Contest Winners**

Brian W. Sloboda  
Pricing and Classification  
U.S. Postal Service

### **FFC/2006 Best Conference Paper Awards**

Fred Joutz  
Center for Economic Research  
The George Washington University

9:20 a.m. – 11:30 a.m.                      **Panel Discussion**

11:30 a.m. – 11:40 a.m.                      **Award Presentations and Photos**

Jeff Busse  
U.S. Geological Survey  
U.S. Department of the Interior

11:30 a.m. – 1:00 p.m.                      **Lunch (On Your Own)**



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## **Panel Discussion**

### **Health Care Forecasting: Informing Future Choices**

Forecasting health care costs and health care demand will be critical in the coming decades. Both costs and demand for health care are rising, forcing public policy to address important trade-offs. New technologies and treatments, preparedness concerns, and shortages of clinicians are among the many forces expected to increase costs. At the same time, demographic changes and emerging diseases are among the factors expected to increase demand. All of these changes highlight the uncertainty forecasters face as they attempt to guide policy-makers through the crucial economic choices of the coming decades. The 2008 Federal Forecasters Conference will examine the role of federal forecasters in the evolution of public policy to address the need for sustainable, high-quality health care in a time of change.

#### **Moderator**

##### **Kathleen Sorensen**

National Cemetery Administration  
U.S. Department of Veterans Affairs

##### **Elizabeth Arias, Ph.D.**

Health Scientist, Mortality Statistics Branch  
Division of Vital Statistics  
National Center for Health Statistics

##### **Rima F. Khabbaz, M.D.**

Director, National Center for Preparedness,  
Detection, and Control of Infectious Diseases  
Centers for Disease Control and Prevention

##### **Lawrence R. Deyton MSPH, M.D.**

Chief, Public Health and Environmental Hazards  
Veterans Health Administration  
U.S. Department of Veterans Affairs

##### **John Poisal, MBA**

Deputy Director,  
National Health Statistics Group  
Centers for Medicare and Medicaid Services

#### **Question and Answer Discussion with Audience**

##### **Morning Wrap-Up**

##### **Stephen MacDonald**

Incoming Chair, Federal Forecasters Consortium  
Economic Research Service  
U. S. Department of Agriculture

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## Panel Discussants



**Elizabeth Arias, Ph.D.**  
Health Scientist  
Mortality Statistics Branch  
Division of Vital Statistics  
National Center for Health Statistics

### ***Implications for the Future Health Status and Health Care of the US Population of Changes in Population Composition and Attendant Mortality Patterns***

This presentation will explore the role of historical, current, and projected changes in population composition and attendant mortality patterns on the future health status and health care of the US population. It will present historical, current and projected changes in population composition, predominantly the aging of the population; changes in related survival trends, life expectancy trends, and changes in leading causes of death. The presentation will elaborate on the relationship between changing population composition and mortality regimes and address the possible consequences to the health status and health care of the US population that may result from the aging of the population and its concomitant mortality regime.



**Rima F. Khabbaz, M.D.**  
Director, National Center for Preparedness,  
Detection, and Control of Infectious Diseases  
Centers for Disease Control and Prevention

### ***Controlling Microbial Threats: New Approaches and Ongoing Challenges***

Infectious diseases continue to cause tremendous morbidity and mortality worldwide. Unprecedented social, industrial, environmental, and ecological changes in today's globalized world have given highly adaptable microbes ready access to new geographic areas and populations and spurred a host of newly recognized zoonotic diseases. Political and economic factors also continue to affect the vulnerability of populations to infectious threats--both naturally occurring and intentionally caused. This presentation will describe recent challenges and opportunities in our efforts to prevent and control infectious diseases, including the increasing problem of antimicrobial resistance. It will also describe important lessons learned from our response efforts, including the critical role of preparedness planning, the importance of multidisciplinary partnerships, and the need to contain local outbreaks at their source.



**Lawrence R. Deyton MSPH, M.D.**  
Chief, Public Health and Environmental Hazards Office  
Veterans Health Administration  
U. S. Department of Veterans Affairs

***Lessons for Health Care Forecasting: VA Health Care System's Past Changes and Outlook for 2018***

The U.S. Department of Veterans Affairs operates the largest integrated health care system in the United States with approximately 1400 facilities: hospitals, outpatient clinics, nursing homes, and counseling centers. Our patients often use multiple facilities, sometimes in different states. Keeping individual patient records at each facility was inefficient and potentially dangerous for our patients. In the mid 1990's, an electronic health record was deployed that revolutionized VA's health care system. During a time of changing eligibility rules and increasing numbers of veterans using VA health care facilities, VA decreased in-patient beds, expanded the outpatient capacity, and instituted unheralded improvements in the VA health care system. This presentation will also offer a glimpse of technological changes forecast for the next ten years—for VA and for the overall U.S. health care enterprise.



**John Poisal, MBA**  
Deputy Director,  
National Health Statistics Group  
Centers for Medicare and Medicaid Services

***National Health Spending Projections Through 2017: Divergent Trends Ahead***

Growth in National Health Expenditures (NHE) is expected to be 6.7 percent in 2007 and remain near that same rate over the full projection period (2007-2017). The health share of Gross Domestic Product (GDP) is expected to increase slightly to 16.3 percent in 2007 and then climb to 19.5 percent of GDP by 2017. The leading edge of the "Baby Boom" generation will begin enrolling in the Medicare program in 2011. As a result, a divergence in trends is expected as this shift in coverage is anticipated to contribute to an acceleration in public spending growth and a deceleration in private spending growth. Finally, dissimilar growth rate trends are expected at the sector level, as well. Beginning in 2008 and running through 2017, hospital spending growth is anticipated to slow while prescription drug expenditure growth is expected to accelerate.



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## Afternoon Concurrent Sessions

1:00 p.m. – 2:30 p.m.

### Concurrent Session I

Health Care Issues .....	Room 1
Forecasting Transportation Trends .....	Room 2
Statistical Methods in Forecasts .....	Room 3
Projections of Education and Training Needs .....	Room 7

2:30 p.m. – 2:45 p.m.

### Afternoon Break

2:45 p.m. – 4:15 p.m.

### Concurrent Session II

Special Topics in Forecasting (2:45 pm – 4:30 p.m.) .....	Room 1
Forecasting Impacts of Government Policy .....	Room 2
Evaluating Policy Forecasts .....	Room 3
Cycles, Investment, and Prices .....	Room 7
International Aspects of Forecasting .....	Room 8



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**Concurrent Session I**



## Health Care Issues

*Session Chair: Dan Culver, U.S. Department of Veterans Affairs*

### **Labor Market Effects of Employer Provided Health Insurance**

Rose A. Woods, Bureau of Labor Statistics, U.S. Department of Labor

The relatively high cost of employer provided health insurance has many effects in the labor market. Wages, employment, and hours worked are all thought to respond to increases in the cost of providing health insurance. This paper examines the relationship between employer provided health insurance, wages, hours and employment at an industry level.

### **Estimating Impact of Clinical Training and other Factors on the U. S. Department of Veterans Affairs Nurse Recruitment and Retention Efforts**

Dilpreet K. Singh, Linda D. Johnson, Karen M. Sanders, Malcolm Cox, Robert Zeiss, Evert Melander, U.S. Department of Veteran Affairs

The U. S. Department of Veterans Affairs (VA) employs over 50,000 registered and licensed practical nurses. However, there is a shortage of nurses partially contributed by aging of nursing workforce who are eligible to retire. A high percent of all VA nurses receive a part or all of their training at VA. Nursing students can be a great source of future recruits at VA. A VA Nurse Recruitment and Retention Survey was conducted to estimate impact of clinical training and other factors on VA's nurse recruitment and retention efforts. This paper presents results of the Survey including factors that impact seeking employment with VA.

### **Rescinding Community Mitigation Strategies in an Influenza Pandemic: An Agent-Based Modeling Approach**

Victoria J. Davey, U.S. Department of Veteran Affairs and Robert J. Glass, National Infrastructure Simulation and Analysis Center

We used an agent-based computational model to simulate influenza pandemics in a U.S. community and evaluate thresholds for rescinding community mitigation measures. We rescinded home sequestering of children or all community members when new illness cases had waned in either mild or severe pandemics. A 0 case/7 day rescinding threshold reduced the number of days strategies were needed by 6 percent to 32 percent in mild or severe pandemics, respectively. Strategies were resumed if cases recurred and were most effective when employed with high compliance. Using strict rescinding thresholds, the need for strategies was reduced without increasing illness rates.

## **Forecasting Transportation Trends**

*Session Chair: Fred Joutz, The George Washington University  
Pheny Weidman, Bureau of Transportation Statistics*

### **How the Seasons Impact Traffic Congestion: A Study of Three U.S. Cities**

Peg Young, Bureau of Transportation Statistics

Congestion on our nation's highways has become a major issue facing many state and local agencies. At the national level, reducing congestion is one of the strategic goals of the U.S. Department of Transportation. Most urban areas of the country have experienced rising levels of congestion, as the increased volume of vehicular traffic exceeds the capacity of the transportation system being used. This report takes a unique view at congestion for three US cities, Chicago, Los Angeles, and Houston, by estimating the impact of seasons on congestion. By estimating how much more or less congestion is experienced monthly for each city, it can be shown how congestion in morning travel and evening travel differ through the year, as well as the differences occurring in weekend and weekday congestion.

### **Trends in Personal Income and Passenger Vehicle Miles Traveled (VMT)**

Jeffery Memmott, Bureau of Transportation Statistics

For years, increasing income has been a principal factor contributing to the rapid growth of highway passenger travel. As incomes increased, the demand for additional transportation services manifested itself in a variety of ways: more individuals and households acquired personal vehicles; the proportion of multiple vehicle households grew; families moved to larger and more comfortable housing in the suburbs, thereby increasing commuting trip distances; and the number and length of discretionary trips increased. As a result, passenger highway travel, as reflected in vehicle miles of travel (VMT), increased rapidly. But there have been discussions since at least the early 1990s about whether the effects of rising incomes on travel demand would start to diminish. That speculation now appears to be a reality as recent data suggest the relationship has weakened—vehicle travel growth has started to slow in comparison to growth in real personal income. This presentation provides evidence on the relationship between VMT and personal income, along with factors affecting that relationship.

### **Time Series Analysis of Aviation Revenue Passenger Miles (RPMs)**

Gary Feuerberg, Bureau of Transportation Statistics

Airline revenue passenger miles (RPMs) are one indicator of how the airline industry is performing. Two recent events caused significant declines in airline RPMs—the terrorist attacks of September 11th, 2001, and the SARS (Severe Acute Respiratory Syndrome) outbreak in Asia that followed in 2003. The effects of 9/11 are apparent even in the raw data, but the impact of the SARS scare is masked by seasonal fluctuations. This paper discusses the potential for analysis of time series data once seasonality has been removed. In October 2004, the Bureau of Transportation Statistics (BTS) began to seasonally adjust airline passenger data for use in its monthly Transportation Services Index, using X-12 ARIMA, release 0.2. Monthly RPM data fluctuate continually, making the underlying trend difficult to ascertain. Trend patterns in the data come into full view when the erratic seasonal factors are removed, revealing the airline RPM decline during the second quarter of 2003.

## Statistical Methods in Forecasts

*Session Chair: Charlie Hallahan, U.S. Department of Agriculture*

### Monitoring Processes with Changing Variances

J. Keith Ord, Georgetown University

Statistical process control (SPC) has evolved beyond its classical applications in manufacturing to monitoring economic and social phenomena. This extension requires consideration of autocorrelated and possibly non-stationary time series. Less attention has been paid to the possibility that the variance of the process may also change over time. In this paper we use the innovations state space modeling framework to develop conditionally heteroscedastic models. We provide examples to show that the incorrect use of homoscedastic models may lead to erroneous decisions about the nature of the process. The framework is extended to include counts data, when we also introduce a new type of chart, the P-value chart, to accommodate the changes in distributional form from one period to the next.

### Improving Health Care Efficiency to Accommodate Increased Demand Due to Increased Access: A case study of a Washington D.C. Federally Qualified Health Center

Steven Kroll, Bureau of Labor Statistics, U.S. Department of Labor

Access to, and quality of, health care are two major criterion when evaluating health services. This paper is unique to health care forecasting in regards to its focus; the evaluation of primary health services to low-income and homeless residents. Using cycle time and clinic intake data collected from a non-profit health clinic, sampling theory, statistical imputation, and non-parametric testing are first applied to estimate provider service times by visit type. Queue theory and dynamic programming techniques are then implemented to calculate a capacity schedule. A discussion on the application of government data to improve the clinic's expectations, processes, and positioning concludes the report.

### NeuroSequences: A Method to Improve Neural Networks in Healthcare Predictive Modeling

Hung-Han Chen, BlueCross BlueShield and Michael T. Manry, University of Texas at Arlington

This paper presents a practical method to improve the performance of MLP neural networks on healthcare predictive modeling. By adding a layer of data exploration using SOM, the data is clustered, the topology property is preserved, and the task of predictive modeling is transformed to less complexity with the concept of "divide and conquer." The impacts of this new method are discussed and models of 3-month inpatient risk for 2.4 million insured members, an extreme unbalanced data, are compared to the result of a leading commercial risk score software.

**Projections of Education and Training Needs**

*Session Chair: Tom Snyder, National Center for Education Statistics*

**Employment Related to Medical Care Spending**

Eric Figueroa, Bureau of Labor Statistics, U.S. Department of Labor

This study examines employment related to personal consumption expenditures on medical care services. Using input-output methods developed by the Bureau of Labor Statistics, employment related to spending on medical care over the 1998 to 2006 period is compared with expected employment for 2016. The impact of changing patterns of consumption spending is examined, and occupational employment data for 2006 and 2016 are compared.

**The National Center for Education Statistics Projections Program**

William Hussar, National Center for Education Statistics

The U.S. Department of Education’s National Center for Education Statistics (NCES) has been producing projections of education statistics since 1964. This presentation will examine the NCES projections program. Topics to be discussed in this presentation include: (1) the users of the NCES projections; (2); data sources used in developing the projections; (3) the different education statistics that are projected by NCES; (4) the different methodologies used in producing the projections; and (5) the accuracy of the NCES projections. Examples of the projections and measures of projections accuracy will be taken from the recently released Projections of Education Statistics to 2016.

**Job Outlook for College Graduates**

Roger Moncarz and Olivia Crosby, Bureau of Labor Statistics, U.S. Department of Labor

Learn which occupations will offer the best prospects for today’s college graduates. The talk will focus on how changes in the technology, global competition and business practices are expected to reshape tomorrow’s job market and how these changes will affect education and training needs.

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**Concurrent Session II**



## Special Topics in Forecasting

*Session Chair: Jeff Busse, U.S. Geological Survey*

### **Proxies, Price Measures, and the Prospective Payment Systems: Forecasting Inflationary Price Measures for Medicare**

Benjamin Porter, CMS OACT Market Basket Team and Global Insight Market Basket Team

Through an assortment of prospective payment systems (PPS), Medicare purchases annually over \$270 billion in health care goods and services. The Centers for Medicare and Medicaid Services (CMS) develops the statutorily-required input price indexes that provide the foundation for yearly updates to those PPS payments. These indexes, or market baskets, are intended to solely measure the inflationary price pressures that face Medicare providers in efficient markets. This analysis examines the construction of the market basket input cost categories, the calculation of their respective cost shares, and the modeling techniques used to forecast the various price proxies assigned to those categories.

### **Evaluating Census Forecasts**

Herman Stekler, The George Washington University

The Census Bureau makes periodic long-term forecasts of both the total US population and the population of each of the states. Previous evaluations of these forecasts were based on the *magnitude* of the discrepancies between the projected and actual population figures. However, it might be inappropriate to evaluate these long-term projections with the specific quantitative statistics that have been useful in judging short-term forecasts. One of the purposes of a long range projection of each state's population is to provide a picture of the distribution of the aggregate US population among the various states. Thus the evaluation should compare the projected distribution of the total US population by states to the actual distribution. This paper uses the dissimilarity index to evaluate the accuracy of the Census projected percentage distributions of population by states.

### **Forecasting Tanker Spot Market Rates**

Fred Joutz, The George Washington University

### **Forecasting Interments and Gravesites in VA National Cemeteries**

Kathleen Sorensen, U.S. Department of Veterans Affairs, National Cemetery Administration

The U.S. Federal Government has a commitment to veterans to provide them with certain benefits including burial in a national cemetery. In fiscal year 2007, more than 100,000 veterans and their dependents were buried in national cemeteries. Forecasting future demand for burial sites in existing national cemeteries and estimating depletion dates of available sites in developed and undeveloped cemetery land is an essential planning tool. This paper presents a new model that uses projected veteran deaths by county, ratio correlation and perpetual inventory methods to meet the needs of budget and policy analysts.

**Forecasting Impacts of Government Policy**

*Session Chair: Michelle Chu, Internal Revenue Service*

**Forecasts of National Health Expenditures Under An Individual Mandate and Premium Subsidies**

Charles Roehrig, George Miller, and Mike McLendon, Altarum Institute

This paper will provide forecasts through 2030 of national health expenditures under the assumption of universal coverage achieved through an individual mandate combined with federally subsidized premiums to make insurance affordable for all. It will include alternative scenarios in terms of health inflation and GDP growth rates. Expenditures will be presented by source of funds so that the total federal component of spending can be identified. This will provide an important extension of forecasts developed by GAO and CBO that focus on Medicare and Medicaid spending requirements. Forecasts will be generated using the Altarum Health Sector Model.

**Forecasting Federal Estate Tax Return Filings**

Taukir Hussain, Internal Revenue Service

The estate tax is one component of the federal transfer tax system together with the gift and generation-skipping tax. The Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001 introduced major changes to the estate tax structure. The law provides for a gradual increment in the exemption amount for decedents, based on year of death. The filing threshold was \$1 million in 2002, and will reach \$3.5 million by 2009. The tax is then repealed for deaths occurring in 2010, but reinstated for deaths in 2011 and beyond, with a \$1 million exemption. In this paper, we develop a methodology to forecast the number of estate tax returns to be filed taking into account the peculiarities of EGTRRA as it applies to the federal estate tax.

**Economic Implications of Future Years Defense Spending**

Soyong Chong, Program Analysis and Evaluation Directorate Office of the Secretary of Defense

On December 2007, the Chairman of the Joint Chiefs of Staff, Admiral Michael Mullen, told the press that the nation needs to permanently set U.S. defense spending at 4.0 percent of the national gross domestic product (GDP). If Chairman’s statement gets accepted, it translates into \$894 billion in defense spending by FY 2018 using CBO’s GDP projection. This being said, both inside and outside the Pentagon, defense policy analysts, businessmen and economists are interested in the economic implications of these defense purchases. To measure the economic implications of defense spending, I use the Defense Employment and Purchases Projection System (DEPPS) to estimate demand for subassemblies, parts, and materials that the Defense Department generates through its purchases.

## **Evaluating Policy Forecasts**

*Session Chair: James Franklin, Bureau of Labor Statistics, U.S. Department of Labor*

### **Federal Revenue Forecasting**

Rudolph G. Penner, Urban Institute

Federal revenue forecasts are crucial to debates about budget policy. But revenue forecasts are often very wrong despite being prepared by very talented analysts. This paper describes the forecasting process used by the Congressional Budget Office (CBO) and documents past errors. The errors tend to be serially correlated. That is to say, if CBO is too optimistic (pessimistic) one year, they are very likely to be too optimistic (pessimistic) the next year as well. The paper speculates about the reasons for this phenomenon. It concludes by arguing that the uncertainty of forecasts should play a much larger role in debates regarding budget policy.

### **Multivariate Forecast Evaluation Based on Linear Policy Rules**

Edward N. Gamber, Tara M. Sinclair, H.O. Stekler, and Elizabeth Reid, The George Washington University

This paper introduces a new methodology for quantitative evaluation of policy forecast errors when there is more than one variable which is important for the policy decision. Our methodology can be used to jointly evaluate the forecasts of any number of variables that are made at the same time and that have policy implications. As an example, we apply this methodology to the Federal Reserve forecasts of U.S. real output growth and the inflation rate.

### **Estimating Federal Reserve Behavior: An Augmented Reaction Function Using Real Time Data**

Paul Sundell, U.S. Department of Agriculture Economic Research Service

Reaction functions based on the Taylor Rule have become the basic applied model for forecasting Federal Reserve behavior. In the basic backward looking Taylor rule, the federal funds rate is a function of inflation, the deviation of inflation from target, and the deviation of output from target while forward looking version of Taylor rule typically add forecasts of inflation and GDP growth relative to potential GDP growth. I augmented the forward looking Taylor rule reaction function to include additional variables that influence Federal Reserve behavior by providing information on the state of the economy and risks to the economy. In-sample and out-of sample forecasting results are presented in the paper.

**Cycles, Investment, and Prices**

*Session Chair: Keith Ord, Georgetown University*

**The Housing Bubble and the Resulting Impact on Employment**

Kathryn Byun, Bureau of Labor Statistics, U.S. Department of Labor

From the late 1990s through 2006, investment in residential construction grew at an unprecedented rate. This demand resulted in jobs not only in the construction industry but throughout the economy. Using the input output system developed by the Employment Projections program within the Bureau of Labor Statistics, we can estimate the employment by both industry and occupation that was generated to meet this run-up in demand. Historical data from 1996-2006 and projected data for 2016 will be examined for residential and nonresidential construction and compared to overall demand.

**Forecasting, Structural Change, and Empirical Confidence Intervals**

Stephen MacDonald, Economic Research Service, U.S. Department of Agriculture

A history of past forecasts can be a rich source of information on the error characteristics of future forecasts. In a rapidly changing world, however, structural change can diminish the usefulness of this assumption. This paper will explore how the characteristics of past forecast errors can be used to predict the characteristics of future errors in an efficient, unbiased manner. Different measures of structural change, and different sources of information on structural change will be matched with appropriate adjustment methods to yield estimates of future forecast error distribution that exploit all available information: information both of past actual or hypothetical forecasts and of current variable characteristics that have been altered by structural change.

**The Business Cycle, the Long Wave, and the Limits to Growth**

Foster Morrison and Nancy L. Morrison, Turtle Hollow Associates, Inc.

The short-term business cycle is universally recognized as a dynamic process that can be modeled and forecast by the established methodology, a noise-driven damped linear system. Rather controversial is the “long wave,” a series of major financial crises that occur with a period that some analysts have identified as 54 years. By contrast, the “limits to growth” hypothesis can be demonstrated with quite basic mathematics. The challenge for forecasters and other analysts for the early twenty-first century is to predict, as well as possible, the interactions of these three phenomena. Some basic scenarios are presented.

## **International Aspects of Forecasting**

*Session Chair: Vidya Kori, International Trade Administration*

### **Energy in 2020: Assessing the Economic Affects of Commercialization of Cellulosic Ethanol**

Stefan Osborne, International Trade Administration, U.S. Department of Commerce

U.S. dependence on imports of crude oil has steadily increased for three decades. One way to reduce this dependence is to increase domestic production of renewable fuels such as ethanol. This report examines the effect on the U.S. economy in 2020 if advances in technology allow cellulosic ethanol to become commercially viable and if cellulosic ethanol production becomes adequate to allow total ethanol production to reach 30 billion gallons (including 10.5 billion gallons of corn-based ethanol). We find reaching these targets lowers crude oil imports by 460,000 gallons per day and increases U.S. consumption by \$12.6 billion in 2020.

### **Domestic Jobs Attributable to U.S. Exports**

Mirko Novakovic and Betty W. Su, Bureau of Labor Statistics, U.S. Department of Labor

Over the past two decades, the growing economic interdependence of countries worldwide through increasing volume and variety of cross-border transactions in goods and services, free international capital flows, and more rapid and widespread diffusion of technology have become increasingly important in U.S. economic activity. This study focuses on domestic jobs attributable to U.S. exports. Using the available historical data and the most recent U.S. economic and employment projections developed by the Bureau of Labor Statistics, the export-related jobs by industry are compared for the 1996-2006 and 2006-2016 periods, and conclusions are drawn regarding the job impacts of accelerating globalization on the U.S. economy.

### **Modeling Tourism Demand for Indonesia**

Cynthia Haliemun, Quincy University and Brian W. Sloboda, U.S. Postal Service

Indonesia serves as a major tourism attraction in the south Pacific primarily for its exotic locale and the existence of many islands which offer an array of activities. In fact, tourism is a dominant industry in Indonesia which comprises approximately 70 percent of its GDP. Given the preeminence of tourism in Indonesia, their tourism sector is vulnerable to terrorist attacks by extremist groups such as the effects of the Bali bombings in October 2002 and other terrorist attacks throughout Indonesia since these bombings. Additionally, Indonesia experiences earthquakes and other natural disasters since Indonesia is part of the Pacific Rim as shown with the tsunami in December 2004. Given the consequences of these terrorist attacks and natural disasters, these events potentially have consequences on the Indonesian tourism sector.

The goals in this paper are to contribute an empirical study of tourism demand dynamics for the Indonesian tourism sector using time series methods of seasonal integration and cointegration. These methods will allow us to examine the effects of terrorism and natural disasters on the Indonesian tourism sector.

