Seasonal Adjustment Practitioners Workshop (SAPW)

Friday, November 4, 2016

Keynote Speakers

Afternoon Concurrent Sessions 1

1a: Advanced Topics in Seasonal Adjustment and Time Series Modeling
1b: Working With Time Series at a Federal Agency
1c: Modeling and Adjusting for Weather and Other Effects

Afternoon Concurrent Sessions 2

2a: Residual Seasonality and Related Topics
2b: New Software, Utilities and Techniques
2c: Calendar Adjustment and Moving Holidays
Some Historical Perspectives on Seasonal Adjustment
-William R. Bell, U.S. Census Bureau

Seasonal adjustment has been performed on economic time series for almost 100 years. This began with early efforts in the 1920s and 1930s and continued with the development of computerized methods of seasonal adjustment by Julius Shiskin and his colleagues at the Census Bureau in the 1950s and 1960s, culminating in the development of the X-11 seasonal adjustment program. Developments in seasonal time series modeling, especially the path-breaking 1970 book by Box and Jenkins, led to hybrid methods combining time series modeling with seasonal adjustment (e.g., X-11-ARIMA), and in the 1980s and beyond to time series model-based methods of adjustment. The talk will review this history to show how techniques have evolved to the present day, and close with some remarks about possible directions for the future.

The Evolution of Seasonal Adjustment at BLS: From the Ratio-to-Moving Average to Model Based Methods
-Richard Tiller, Bureau of Labor Statistics

During my career at BLS there have been major developments in the practice of seasonal adjustment. When I started at BLS in 1975, the Seasonal Factor Method was still in use. It was an early competitor to Census Method II, under development by Julius Shiskin at the Census Bureau, and ultimately contributed to the development of X-11. From the 1970’s through the current decade BLS has moved from X-11 to X-11-ARIMA, X-12 and finally to X-13 with its model based capabilities. These mainstream methods have worked well for national aggregate series but not well for series at sub-national levels that are generated from surveys with small sample sizes. For this problem, BLS adopted an unobserved component model approach which explicitly accounts for survey error in the estimation of the conventional time series components. State CPS series are used as an example.
Quality Assurance of Seasonal Adjustment Process  
-Susie Fortier, Statistics Canada

This talk will present an approach that is being developed at Statistics Canada to evaluate and maintain the quality of seasonal adjustment on an ongoing basis. The presentation will include the aspects of quality that are prioritized, as well as an overview of the current organization process for larger-scale production. Finally, a dashboard that has been developed to summarize the adjustment of a specific series will be presented. The dashboard includes a summary of key quality diagnostics, and information on the estimated components used in the adjustment at a given point in time.

Note: Steve Mathews of Statistics Canada is a co-author of this presentation.

Seasonal Adjustment in the Private Sector  
-Catherine Harvill Hood, Catherine Hood Consulting

At Catherine Hood Consulting, we see a variety of clients interested in different aspects of seasonal adjustment. Some clients are interested in seasonally adjusting their own data, sometimes using the methods used to seasonally adjust government series. Other clients are interested in predicting government press releases either to make money in the stock markets or to advise clients of their own. Some clients are interested in analyzing published seasonal adjustments, sometimes to analyze revisions. We will give a brief overview of what our clients are looking for in government press releases and seasonal adjustment input files.
Afternoon Concurrent Session 1a: Advanced Topics in Seasonal Adjustment and Time Series Modeling

An Introduction to Weekly Seasonal Adjustment
- Thomas D. Evans, Bureau of Labor Statistics

Most official government agencies do not publish seasonally adjusted weekly series. There are obvious reasons for this: Weekly seasonal adjustment is more complicated than adjustment for monthly or quarterly data, and there are few official weekly series. Compounding the complexity is that standard seasonal adjustment software, such as X-13ARIMA-SEATS, is not suitable for weekly data as it assumes constant periodicity of the data. The basics of adjusting weekly data will be explained, and comparisons will be made to our current regression approach with a structural time series model.

Modeling and Seasonal Adjustment of Daily Retail Series
- Tucker McElroy, Brian Monsell, Rebecca Hutchinson, Daniel Fernandez, U.S. Census Bureau and Palantir

This paper provides multivariate analyses of daily retail data, extracting annual and weekly seasonal patterns along with moving holiday effects using an unobserved components framework. It is shown that the weekly seasonality corresponds to the trading day effect observed in monthly time series, and that nuanced modeling of moving holidays (such as Black Friday, Cyber Monday, Easter, and Labor Day) is possible and advantageous. Computational challenges are overcome by utilizing a signal extraction windowing scheme.

Modeling Seasonality in High-Frequency Data
- Ruey S. Tsay, H. Lopes and A. Virbickaite. Booth School of Business, University of Chicago

High-frequency time series data often exhibit seasonality. The transaction-by-transaction data of financial market show not only diurnal patterns but also weekly and annual seasonality. Similar features are observed in hourly measurements of particulate matter, e.g. PM2.5, in many locations. We investigate statistical models (both structural and reduced-form) that are flexible and can adequately describe the stochastic seasonality of such time series. Special attention is paid to the relatively weak low-frequency seasonality in the high-frequency data. Practical implications of the proposed models are discussed. We also consider the effects of outliers and missing values.
Model-Based and Semi-Parametric Estimation of Time Series Components and Mean Square Error of Estimators
  -Michael Sverchkov, Bureau of Labor Statistics

This paper will focus on time-series analysis and more specifically, on estimation of seasonally adjusted and trend components and the mean square error (MSE) of the estimators. We shall compare the component estimators obtained by application of the X-11-ARIMA method with estimators obtained by fitting state-space models that account more directly for correlated sampling errors. The component estimators and MSE estimators are obtained under a different definition of the target components. By this definition the unknown components are defined to be the X-11 estimates of them in the absence of sampling errors and if the time series under consideration is long enough for application of the symmetric filters imbedded in this procedure. We propose new MSE estimators with respect to this definition. The performance of the estimators is assessed by using simulated series that approximate a real series produced by the Bureau of Labor Statistics in the U.S.A.
Afternoon Concurrent Session 1b: Working With Time Series at a Federal Agency

Annual Seasonal Adjustment Process for the Value of Construction Put In Place Survey
- Courtney Harris, U.S. Census Bureau

The Value of Construction Put in Place Survey (VIP) estimates of the total dollar value of construction done across the U.S. on a monthly basis. Each spring, the Construction Surveys Statistical Methods Branch reviews the specification files used to produce the seasonally adjusted VIP estimates. This paper will discuss the VIP annual seasonal review process from the preliminary review through the final review, including an overview of the Seasonal Component System (SCS), a tool that plays a major part in the VIP seasonal review.

Benchmarking Two Sets of Time Series
- Lynn Imel, U.S. Census Bureau

Data from the same target population collected at different spans of time can be inconsistent. For example, estimates collected monthly do not necessarily sum to measures from an annual survey. The adjustment process referred to as benchmarking solves inconsistency problems such as this. Economic programs at the Census Bureau use the Causey-Trager method to benchmark quarterly and monthly time series. Fagan (1999) generalized the method to benchmark a series broken out in two ways. This paper describes the method presented by Fagan and use of the method on economic data.

Seasonal Adjustment Review: An Analyst's Perspective
- Rebecca Hutchinson, U.S. Census Bureau

Seasonal review is an important component of the indicator review process that has long been the domain of indicator managers. Involving our analysts more directly in that process can lead to greater overall efficiencies. This session will walk through the seasonal adjustment review sheets created specifically for our service sector indicator analysts to enhance their industry review while at the same time teaching them the fundamentals of seasonal adjustment.
The Seasonal Adjustment of Federal Judiciary Data
- John Golmant, Administrative Office of the US Courts

The Administrative Office of the U.S. Courts collects and maintains federal court caseload data for a variety of programs. Many of these data are used in the context of projecting future caseload. Some of the time series data exhibit strong seasonality; some less so. Examination of the seasonally adjusted data can often aid the business user in determining future trend direction. Difficulties arise when trendlines are constructed for time series that are not strongly seasonal.
Afternoon Concurrent Sessions 1c: Modeling and Adjusting for Weather and Other Effects

Smoothing away Residual Seasonality in Indirect Series
-Steve Matthews, Statistics Canada

The presentation will focus on an example from Statistics Canada where a seasonally adjusted series is derived using an indirect approach, by aggregating a number of component series which are each seasonally adjusted independently. The extent of seasonality varies among the component series, and a number of them are not seasonally adjusted. However, the faint seasonal pattern in the components combine to lead to residual seasonality in the derived total. An approach was developed to adjust the component series using parameters in the X12ARIMA method which lead to more of a smoothing approach than a traditional seasonal adjustment.

Seasonal Adjustment of Water Quality Trends in Chesapeake Bay
-Rebecca Murphy and Elgin Perry, University of Maryland Center for Environmental Science at the Chesapeake Bay Program

Due to regulatory actions on jurisdictions in the Chesapeake Bay watershed, there is a need to assess water quality improvement. At the Chesapeake Bay Program, we use Generalized Additive Models to analyze 30 years of monitoring data. A strong seasonal cycle exists in most of these data sets, and, in fact, the seasonal cycle sometimes appears to be changing over time. To capture these dynamics, we have included an interacting smooth term between the cyclical season effect and the long term date effect. We will discuss our approach for adjusting for changing seasonality to interpret long-term trends.

Highway Crash Data Seasonal Adjustment Applications
-Roya Amjadi, Federal Highway Administration

The objective of this paper is to show that highway crash data have repetitive and predictable patterns and may benefit from use of Seasonal Adjustment’s predictive models to enhance highway safety and operation efforts to reduce crash fatalities/injuries.

Highway transportation crashes have patterns that repeat over fixed periods of time within the data set for crashes such as motorcycle, bicycles, pedestrians, nighttime,
fixed object, and winter crashes. In some States, these crashes are weekly, monthly, or seasonally. Contributing factors such as weather, vacation, holiday, underlying state of the economy, and others impact these variations.

**Accommodating Weather Effects in Seasonal Adjustment**

- Osbert Pang, Brian Monsell, William Bell, James Livsey, U.S. Census Bureau

Seasonal adjustment is the process of accounting for regular seasonal patterns in a time series. By removing the seasonal effect from the series, a better understanding of the underlying dynamics may be revealed. Weather effects can contribute to a seasonal pattern (for example, agricultural series are likely to experience different levels of activity across seasons that happen to correlate to months). Weather effects can vary greatly from year to year, which is generally not the case for the regular seasonal patterns that are typically handled with seasonal adjustment. An unaccounted-for weather effect may end up being dismissed as an outlier, so the ability to accommodate a weather effect for seasonal adjustment could have some interpretative value. We examine weather data in an attempt to find weather regressors that can help achieve this.
Afternoon Concurrent Session 2a: Residual Seasonality and Related Topics

Residual Seasonality in GDP and GDI: Findings and Next Steps
   - Brent R. Moulton and Benjamin D. Cowan, Bureau of Economic Analysis

This paper presents the results of a component-by-component review of seasonally adjusted gross domestic product (GDP) and gross domestic income (GDI) estimates, two economic measures published by the Bureau of Economic Analysis (BEA). The review examined specific components for "residual seasonality" and identified the main causes. The review found that the two most important causes of residual seasonality were (1) inconsistencies arising from the manner in which monthly source data are utilized in the compilation of quarterly estimates and (2) issues arising from revision policies and practices that prevented the updated seasonal adjustments from being applied to historical time series.

The paper is available in full at our website:

Detecting Residual Seasonality in Seasonally Adjusted Monthly Series
   - David F. Findley (Consultant) and Demetra P. Lytras, U.S. Census Bureau

The most fundamental seasonal adjustment deficiency is detectable seasonality after adjustment. Residual seasonality has reduced amplitudes and other properties which make it necessary to undertake its detection differently from seasonality detection in unadjusted series. We investigate residual seasonality detection properties of three types of diagnostics, regression, spectrum and positive seasonal autocorrelation, all from official software. They were applied to underadjusted U.S. Census Bureau Monthly Retail Trade Survey series with evidence of changing seasonality that were adjusted only for stable seasonality. Residual seasonality findings for the irregular component series are similar but also complementary to those for the seasonally adjusted series.
The Effects of Seasonal Heteroskedasticity in Time Series on Trend Estimation and Seasonal Adjustment
-Thomas M. Trimbur and William R. Bell, U.S. Census Bureau

Seasonal heteroskedasticity – regular changes in variability over the calendar year – occurs in a range of economic time series and can affect the signals taken from key indicators, useful in discussions related to economic analysis and policy making. In this paper, we investigate the role of seasonal heteroskedasticity in trend estimation and seasonal adjustment. In particular, we consider standard time series models expanded to include a seasonally heteroskedastic irregular component. This forms the basis for estimating trends more robust to forces like severe weather that are linked to the annual cycle. In an application to time series of U.S. housing starts, we examine the properties of extracted signals that they produce and demonstrate the empirical relevance of weather-related volatility around the winter months for estimating trend and seasonally adjusted series.
Afternoon Concurrent Session 2b: New Software, Utilities and Techniques

Editing Spec Files with X-13-SAM
-Demetra Lytras, U.S. Census Bureau

Although editing spec files one at a time is simple and can be done with any text editor, making changes to multiple spec files can be a cumbersome task. X-13-SAM simplifies this task. X-13-SAM can edit existing arguments, remove or add arguments or entire specs, and comment out specs or arguments. It has special capabilities with certain arguments, including inserting or removing regressors into the variables argument, editing only part of an ARIMA model, and changing the directory only in a file statement. These features, and more, will be demonstrated.

Generating Reports from X-13ARIMA-SEATS Diagnostic Output, A Beginning
-Kathleen M. McDonald-Johnson, U.S. Census Bureau

Documenting review of time series models and seasonal adjustment settings often requires writing a report that contains details about processing changes or updates. Reporting templates are useful for keeping certain formats, but they cannot detect errors in the information. In the context of a project involving modeling for outlier or intervention analysis, I present some considerations for creating a report that highlights and documents changes, diagnostics of note, and settings of interest. Using X-13ARIMA-SEATS diagnostic output and SAS software, anyone can generate a report, or at least the skeleton of a report, easily.

Learning and Discussing Seasonal Adjustment with R
-James Livsey, U.S. Census Bureau

R is a free open-source programming language with a special focus on data and statistics. R can be used not only for statistics, but also as a general scripting tool for many data related tasks. R also offers fantastic interfaces to other software, such as X-13ARIMA-SEATS.

This talk will have two parts. First, the interface between R and X-13ARIMA-SEATS will be discussed. This will focus on the seasonal package authored by Christoph Sax. An example is www.seasonal.website, a website which allows you to interactively adjust your time series with X-13-ARIMA-SEATS. I will show how both new and experienced X-13ARIMA-SEATS users can benefit from the flexible input and output structure of this package.
So You Just Got 300 New Series You Need to Seasonally Adjust...
-Brian Monsell and Osbert Pang, U.S. Census Bureau

What would you do if someone came to you with 300 new time series and asked you to seasonally adjust them? This paper gives details of what the authors did when confronted with this task. Economists from the Center for Economic Studies asked the team to provide adjustments for the quarterly Business Formation series. We will show how we used the seasonal R package in our work, including some new functions that allow easy access to the X-13ARIMA-SEATS diagnostic output.
Afternoon Concurrent Sessions 2c: Calendar Effects and Moving Holidays

Transportation Data and Holiday Regressors
- Theresa Firestine, Department of Transportation

Holidays that affect more than one month are included as regressors in seasonal adjustment models to control for the year-to-year variation they introduce. The holiday regressors available for inclusion in seasonal adjustment programs control for only pre-holiday activity. These regressors are not ideal for transportation data series, because passenger travel occurs both before, on, and after a holiday. The Bureau of Transportation Statistics of the US Department of Transportation presents transportation specific holiday regressors and their use in the seasonal adjustment of passenger travel by air, rail, transit, and private motor vehicle.

Calendar Effects and Omitted Variables in Employment Time Series
- Steven M. Mance, Bureau of Labor Statistics

Calendar effects are often found in economic time series and removed as part of the seasonal adjustment process. Although these effects may represent important causal factors, their estimation may be subject to omitted variable bias, and unrelated phenomena are sometimes "explained" by the calendar. The Current Employment Statistics (CES) survey uses a calendar effect to control for the number of weeks between survey reference periods. An alternative procedure is explored for state-level series to screen for unrelated events (modeled as outliers) prior to incorporating the calendar effect. Out of sample forecast performance is compared for direct and indirect adjustments.

It's All Foreign to Me: The Trials and Tribulations of Seasonally Adjusting Foreign Trade Data by Country Grouping
- Elizabeth Marra and Samantha Nguyen, U.S. Census Bureau

The International Trade Program of the U.S. Census Bureau publishes detailed seasonally adjusted data for U.S. import and export merchandise trade by geography. This practice began in January 2014 and the Census Bureau releases the data in the monthly U.S. International Trade in Goods and Services Report (FT-900). This report includes adjustments for single countries as well as for country groupings like the Organization of the Petroleum Exporting Countries (OPEC) and the European Union (EU). There are many unique challenges that come with seasonally adjusting these geographically based series. This presentation details the analysis and methods used to address some of these challenges.)