2nd Seasonal Adjustment Practitioners Workshop

Thursday, April 26, 2018

Keynote Speaker: Dr. Ataman Ozyildirim
Discussant: Dr. Brent Moulton

Morning Concurrent Sessions 1: Alternate Methods of Seasonal Adjustment

Morning Concurrent Sessions 2: Practical Issues in Seasonal Adjustment Production

Afternoon Concurrent Sessions 1a: Seasonal Adjustment Diagnostics and Quality Assurance

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Keynote Speaker and Abstract

To Adjust or Not to Adjust: A Users' Perspective on Analysis of Economic Trends with Seasonal Data

Economic data commonly exhibits regular seasonal fluctuations that could easily obscure underlying cyclical or structural trends. Seasonal adjustment is necessary for business and economic analysis. Numerous methodologies have been developed to remove predictable seasonal patterns to reveal the underlying trend and cycle in economic variables. Understanding past business cycles, knowing the current state of the economy, and predicting the future all require looking past the seasonality in the data. But, when is seasonal adjustment appropriate? What are the best practices? What happens when long-tested seasonal patterns no longer hold? What are the pitfalls and challenges in analyzing seasonal and seasonally adjusted data at the level of industries, national economies, and international economies?

About our speaker: Dr. Ataman Ozyildirim is an economist and director of business cycles and growth research at The Conference Board. He joined The Conference Board in 1999 as part of the Global Business Cycle Indicators Program that produces The Conference Board Leading Economic Index® for the United States, the Euro Area, China, and ten other countries. In addition to leading The Conference Board research program on business cycles and developing business cycle indexes for emerging economies, he also manages the research program in productivity, innovation and competitiveness, as well as on the annual Global Economic Outlook.

Before coming to The Conference Board, Ozyildirim worked for Management Science Associates, Inc. in Pittsburgh and served as a lecturer at Pennsylvania State University. A native of Istanbul, he received his BA in economics from Ithaca College and his PhD in economics from Pennsylvania State University.

About our discussant: Dr. Brent Moulton worked in the federal statistical system for 32 years—at BLS from 1985 to 1997, and at BEA from 1997 to December 2016. He is now retired and is blogging to help explain official statistics and to keep abreast of the changes that are happening in the blog, "Political Arithmetick."

Dr. Moulton has BA and MS degrees in economics from Brigham Young University and a PhD in economics from the University of Chicago. (The late Arnold Zellner was the chair of his thesis committee.) During the 1990s he was head of price research at BLS during the Boskin Commission era. While at BEA he was head of the national accounts program. Dr. Moulton was also the recipient of the 2015 Shiskin Award.

Morning Concurrent Sessions 1: Alternate Methods of Seasonal Adjustment

Seasonal Adjustment without Revisions

-Barend Abeln

Seasonality in macroeconomic time series can `obscure' movements of other components in a series that are operationally more important for economic and econometric analyses. Indeed, in practice, one often prefers to work with seasonally adjusted data to assess the current state of the economy and its future course. This paper presents a seasonal adjustment program called CAMPLET, an acronym of its tuning parameters, which consists of a simple adaptive procedure to separate the seasonal and the non-seasonal component from an observed time series. Once this process is carried out there will be no need to revise these components at a later stage when new observations become available.

Recently, two most widely used seasonal adjustment methods, Census X-12-ARIMA and TRAMO-SEATS, merged into X-13ARIMA-SEATS to become a new industry standard. In this paper, we compare and contrast CAMPLET with X-13ARIMA-SEATS.The paper describes the main features of CAMPLET and provides a brief review of X-13ARIMA-SEATS. We evaluate the outcomes of both methods in a controlled simulation framework using a variety of processes.

Applying the EM Algorithm to Multivariate Signal Extraction

-James Livsey, U. S. Census Bureau

Multivariate signal extraction can be accomplished through the use of latent component models, for which typically the number of parameters increases quadratically with dimension. Heuristically, this is because the linear filtering theory is built upon knowledge of variance and covariances. A new approach is to use the EM algorithm to implicitly compute maximum likelihood estimates (MLEs), or perhaps approximate the true MLEs. EM, or Expectation-Maximization, proceeds by the concept of a full data likelihood, which in this context amounts to considering the data jointly with the signals of interest.

Automatic Detection of Seasonality and Seasonal Adjustment Using Wavelets

-Rebecca Killick, University of Lancaster (UK)

Determining the periodicity of seasonal components (if any) within a time series is an important initial step in analysing data. Traditionally the seasonal scale is either known, e.g. quarterly, or is estimated using peaks in a periodogram or dummy variables in a regression. When estimating seasonality using the Fourier periodogram we have to determine what are "significant" peaks. There are several methods that attempt to automate peak determination, but all have parameters that the user has to set to encode significance. We will present an alternative approach for automatically determining seasonality using wavelets. Wavelets are an alternative basis functions to the Fourier sinusoids that give a decomposition of frequency bands over time (compared to the Fourier Transform, which gives only a

frequency decomposition). Using the theoretical relationship between wavelet coefficients over these frequency bands we can determine the seasonality of a time series automatically whether it has an hourly, weekly, monthly or decadal season. We will illustrate our methodology for automatic seasonality detection and subsequent seasonal adjustment using simulated and economic data.

Morning Concurrent Sessions 2: Practical Issues in Seasonal Adjustment Production

How Long Is Too Long: Shortening International Trade Time Series
-Rachel Von Bargen 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 commodity/services and geography in the monthly U. S. International Trade in Goods and Services Report (FT-900). The time series consist of monthly data beginning with January 1991 through the most current month available. As time series increase in length, there are many unique challenges that come with seasonally adjusting these series. This presentation investigates possible criteria and methods that will be used to shorten the length of over 300 import and export time series. Audience input is welcomed/appreciated.

Seasonal Adjustment of the Quarterly Summary of State and Local Government Tax Revenue (QTax)
-Eric Valentine, U. S. Census Bureau

The purpose of this paper is to investigate whether the Quarterly Summary of State and Local Government Tax Revenue (QTax) time series are good candidates for seasonal adjustment. We review four QTax itemcodes: Sales Tax (T09), Income Tax (T40), Corporate Income Tax (T41), and Property Tax (T01), to determine whether seasonal adjustment helps to interpret series changes that occur over time. With the X-13ARIMA-SEATS software, we employ the design-based method X-11 and the model-based method SEATS and look at which method works best. We then consider whether to adjust the National series directly or indirectly. The adjustments would be additional information that we could provide to data users, not replacing the current data products.

Revision Span Length of Construction Spending Series
-Demetra Lytras, U. S. Census Bureau

With each annual update of construction spending data, the U. S. Census Bureau revises the seasonally adjusted estimates only as far back as the unadjusted values are revised, typically about two and a half years. Recently questions arose as to whether this is an adequate revision span. This paper investigates alternate revision span lengths for these series.

Afternoon Concurrent Sessions 1a: Seasonal Adjustment Diagnostics and Quality Assurance

A Diagnostic for Seasonality Based upon Autoregressive Roots

-Tucker McElroy, U. S. Census Bureau

We describe a limitation of the Visual Significance (VS) diagnostic for seasonality due to the problem of superposition, illustrating how this can lead to either spurious peaks (Type I error) or shifted peaks (Type II error). As a remedy, we propose to focus attention on the autoregressive roots themselves, which generate peaks in the spectrum. This approach generates a new diagnostic, based on the radial and angular portions of complex autoregressive roots, and we develop a new testing paradigm via asymptotic normality theory.

Examining the Performance of Seasonality Diagnostics for Detecting Residual Seasonality

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

X-13ARIMA-SEATS offers multiple diagnostics for detecting the presence of seasonality in a given time series. These diagnostics tend to be adequate when used for their intended purpose. This may not necessarily be the case, however, when testing a seasonally adjusted series for residual seasonality. Another concern stems from temporal aggregation. Traditionally, quarterly seasonal adjustments are obtained by aggregating monthly seasonal adjustments, and it is possible that the diagnostics yield conflicting results in this situation. A simulation study is done to examine the performance and power of some of these diagnostics; results are presented.

Current Challenges with Quality Assurance of Seasonal Adjustment

-Steve Matthews, Statistics Canada

Availability of information has clearly increased in recent years, and new initiatives are being implemented at Statistics Canada to make more data accessible to users. These factors lead to increased demand for seasonal adjustment and bring challenges due to the nature of the data to be adjusted (level of detail, span length, volatility, etc.). This talk considers the impact of these changes on the practice of seasonal adjustment – specifically on approaches that can be considered along with criteria to guide the decision, and quality indicators

Afternoon Concurrent Sessions 1b: The Human Side of Seasonal Adjustment

Private Sector Seasonal Adjustment in the Age of Trump

-Catherine Hood and Miriam Hood, Catherine Hood Consulting

At Catherine Hood Consulting, we have several different clients interested in analyzing published seasonal adjustments or in predicting government press releases either to make money in the stock markets or to advise clients of their own. Have analysts in the private sector noticed changes in government statistics in the past year? In an era when the stock market reacts more to tweets than to government press releases, how do economists continue to make money using seasonal adjustments? We will give a brief overview of how private sector analysts are coping with the new administration.

Using R to Teach User-defined Holiday Effects

-Miriam Hood, Catherine C. Harvill Hood, and Roxanne Feldpausch, Catherine Hood Consulting

When teaching seasonal adjustment in countries outside of the United States, it can be difficult to explain to the students how to set up custom moving holidays, such as Chinese New Year and Easter Monday, in X13-ARIMA-SEATS. We have found that using R for seasonal adjustment and graphs, with menus in Shiny to help us define regression effects, is a great way to communicate with students and allow them to apply what they learn to their own holidays. We will show you a sample of the menus and the graphs we are using, and some early results of testing for holidays.

Seasonal Adjustment Training, Considerations and Strategies

-Kathleen McDonald-Johnson and Demetra Lytras, U. S. Census Bureau

Training in seasonal adjustment methods is usually necessary for those new to working with time series. Even employees who have had time series courses typically do not have experience with seasonal adjustment. Our courses cover concepts as well as software (X-13ARIMA-SEATS, Win X-13, X-13-Graph, and related programs) and tie the material to the expectations and requirements of the annual seasonal review. The talk will cover some practical considerations we have learned over the years and welcome the audience's advice on training strategies that have worked.

Afternoon Concurrent Sessions 2a: Cycle and Variance Estimation

A Review of the Problem of Seasonal Adjustment Variances

-William R. Bell, U. S. Census Bureau

Many economic indicators (e.g., retail sales, housing starts, labor force statistics) are obtained from monthly or quarterly sample surveys. For such indicators that exhibit seasonal behavior, conventional survey estimation is followed by seasonal adjustment, and it is the seasonally adjusted estimates that are of primary interest. While statistical agencies routinely provide variance estimates for the direct survey estimates, this has generally not been the case for the seasonally adjusted estimates due to certain technical, conceptual, and practical difficulties. We shall review the general problem of seasonal adjustment variances and proposed solutions, focusing on variances for X-11 type adjustment (as there are far fewer problems for getting variances for model-based adjustments).

A Modelled Approximation to the Ideal Filter for Nonstationary Time Series with Application to Business Cycle Fluctuations

-Thomas Trimbur and Tucker McElroy, U. S. Census Bureau

This paper develops a representation of the "ideal" band-pass filter for nonstationary time series. The approach ties together frequency domain perspectives that involve periodicity and gain functions with a statistical modelling framework. The approximating filter has several advantages, for instance compared to existing methods, it has a more attractive gain profile that more accurately matches the targeted pass-band of the "ideal" filter when this is the desired gain. Our proposed filter also addresses the sample endpoint problem associated with previous representations and allows for evaluation of the "ideal" filter's implicit assumptions about trend-cycle dynamics. Further, it reveals how filtering errors can result from the indiscriminate use of the "ideal" filter and allows one to quantify such errors. A more flexible approach is to use a modelling framework and to design band-pass filters that adapt to series' properties – consistent with how the trend and cycle components evolve and relate to each other – rather than emulating a given gain function. Computer code is freely available for implementing the methodology in a way that avoids the need for an expert operator. An application to cyclical fluctuations in macroeconomic time series is presented, showing how plausible and intuitive cycles are estimated via the ideal filter or with an adaptive framework.

Multiyear Cycles: the Case of International Sport Events

-Andreas Bachmann, State Secretariat of Economic Affairs (Switzerland)

Whenever Olympic Games, FIFA world cup or UEFA EURO championship take place, Switzerland's GDP rises. Many international sport associations have their head office in Switzerland and, consequently, their value added is part of Swiss GDP. Therefore, international sport events induce predictable, reoccurring variation to both annual and quarterly GDP. With a frequency of four years, these event effects are neither adjusted for by standard seasonal adjustment procedures nor covered by usual guidelines. This paper suggests a treatment similar to calendar (e.g. leap year) effects to separate the sport event effects from the underlying business cycle.

Concurrent Sessions 2b: Practical Issues in Seasonal Adjustment Production (II)

Outlier Review during Concurrent Seasonal Adjustment of CES State and Area Series

-Jonathan Creem, Bureau of Labor Statistics

The Current Employment Statistics (CES) State and Area program publishes seasonally adjusted data for over 2000 series each month, covering over 400 subnational geographic areas. The seasonal factors used to make these adjustments have traditionally been developed using historical employment data forecasted for one year. A particular challenge in concurrent adjustment of these series is the outsized impact of various events on localized areas. These events range from natural disasters and strikes to unusual weather and are often difficult to properly identify and model at the end of a time series. We describe the monitoring, screening, and review process used to model these events during concurrent adjustment.

The empirical research tests how a stricter critical value policy would affect simulated time series data after an exogenous event is added to the concurrent adjustment process. This exercise provides insight into how the procedure would fare under realistic circumstances and how to handle potential outliers in the data. The results provide evidence that a stricter critical value policy may be beneficial.

Some Discussions on Calendar Effects in X-12-ARIMA

-Francois Verret and Steve Matthews, Statistics Canada

In the context of the seasonal adjustment of a monthly series with the X-12-ARIMA method, the trading day prior-adjustment is sometimes questioned when it is believed that the contribution of each day of the week is different for some months of the year. Of particular interest are months having statutory holidays happening on a fixed date rather than on a fixed day of the week. The need for a distinct adjustment can be implicitly tested and adjusted for with user regressors. The presentation will describe a possible approach and show some Statistics Canada survey series where it was applied.

X-13 Stuff You Should Know

-Brian Monsell and Osbert Pang, U. S. Census Bureau

This presentation is a continuation of the talk I gave at the last seasonal adjustment workshop. We'll provide an update on the project we were working on at the time to seasonally adjust a large set of new series and share some updated R functions and packages that were useful. Then we'll talk about the QS seasonality diagnostic, and a use of the QS diagnostic in the qcheck option to examine the seasonality of quarterly analogs of monthly series.

Predicting Full Year Outcome of Vulnerable Road User Crashes from Partial Year Data

-Wei Zhang, FHWA/Office of Safety R&D, and Lin Xiao, National Research Council

Motorcyclists, bicyclists, and pedestrians are called vulnerable road users (VRU) because they all lack protective hard shell and safety belt. If involved in traffic crashes, VRUs are much more likely to get injured/killed than car drivers. Since VRUs are exposed to ambient environment, their activities exhibit

strong seasonal patterns. This study develops a method of predicting full year outcome of VRU crashes from partial year crash data using knowledge of their seasonal patterns. Good prediction can be made with one/two months' crash data, and accurate prediction can be made with just the first 5 months' crash data.