Seasonal Adjustment Practitioners Workshop 2019

Schedule

8:45 – 9:05	Welcoming Remarks and Introductions	Rooms 1, 2 & 3
9:05 – 9:55	Keynote Address – Jonathan Wright	Rooms 1, 2 & 3
9:55 – 10:10	Discussant – William Bell	Rooms 1, 2 & 3
10:10 – 10:20	Floor Discussion	Rooms 1, 2 & 3
10:20 – 10:40	Break	
10:40 – 12:00	Seasonal Adjustment Tutorial	Rooms 1 & 2
10:40 – 12:00	Morning Sessions – *Topics in Time Series*	Room 3
12:00 – 1:15	Lunch Break – on your own	
1:15 – 2:45	Afternoon Sessions 1a – *Seasonality Detection and Applications*	Rooms 1 & 2
1:15 – 2:45	Afternoon Sessions 1b - *Topics in Modeling*	Room 3
2:45 – 3:00	Break	
3:00 – 4:10	Afternoon Sessions 2a - *New Adjustments at the Census Bureau*	Rooms 1 & 2
3:00 – 4:10	Afternoon Sessions 2b - *Topics in Official Statistics*	Room 3

Keynote Address and Discussant 9:05 – 10:20 Rooms 1, 2 & 3

“Seasonal Adjustment of NIPA Data: Model-Based and Moving Average-Based Approaches”

Abstract:

This talk takes a new look at two long-standing questions in seasonal adjustment. The first is the choice between model-based and moving-average-based seasonal adjustment. In simulations, I find that model-based methods generally perform better, although moving average filters where the specific filters are selected to be close to a pilot model can do well too. The second is the choice between seasonally adjusting at the aggregate or disaggregate level. The latter is the practice in the US, but may give rise to residual seasonality. I present applications to the seasonal adjustment of BLS payrolls data and to NIPA data. One particular finding is that model-based seasonal adjustment of topline GDP data gives seasonally adjusted data that are rather different from published numbers and that do not have a pattern of weak first quarters.

About our speaker:

Jonathan Wright is a professor of economics at Johns Hopkins University, specializing in empirical macroeconomics and finance and time series econometrics. His recent topics of research include high-frequency effects of macroeconomic news announcements, forecasting, seasonal adjustment, the term structure of interest rates, and unconventional monetary policy. He is a Research Associate at the National Bureau of Economic Research. Prof. Wright is an associate editor of the *Journal of Applied Econometrics, Journal of Econometrics* and *Journal of Monetary Economics*, and former coeditor of the *Journal of Applied Econometrics* and *Journal of Business and Economic Statistics*. From 1999 to 2008, he worked at the Federal Reserve Board in the Divisions of International Finance and Monetary Affairs, ending as deputy associate director. He has also taught at the University of Virginia, University of Pennsylvania and University of Maryland. Jonathan Wright did a B.A. at Trinity College Dublin, an M.Sc. at the London School of Economics and a Ph.D. at Harvard University.

About our discussant:

William Bell, Senior Mathematical Statistician for Small Area Estimation at the U.S. Census Bureau, will be the discussant. Dr. Bell’s work in time series methods includes crucial topics, such as software development, modeling of calendar effects, outlier detection, modeling time series with sampling error, variance estimation for seasonally adjusted series, model-based seasonal adjustment, testing for seasonality, among others.

Seasonal Adjustment Tutorial: The Basics
-- Catherine C.H. Hood and Brian Monsell

We will discuss why organizations publish seasonally adjusted data and why we personally recommend using X-13ARIMA-SEATS for the adjustment of monthly and quarterly time series. We will review some definitions, the features of X-13, and provide an overview of both the X-11 method and ARIMA models. This tutorial is intended for participants with little or no experience in seasonal adjustment.

10:40 On Borrowing Information Over Time in Small Area Estimation
-- William R. Bell (U.S. Census Bureau)

We examine alternative models for borrowing information over time in small area estimation. The general problem of small area estimation faced by national statistical offices is to reduce variances of survey estimates that are based on "small" samples by applying statistical models to the estimates that incorporate other data sources related to the population characteristics being estimated. The models combine information from the survey estimates and the additional data sources to produce predictions with error variances lower than those of the survey estimates. The standard area level model of Fay and Herriot (1979) achieves this by using other data as regression covariates. The goal here is to borrow information from past data to achieve greater variance reduction than is obtained by applying the FH model to data only for the most recent time point. This is especially relevant to the particular case where no suitable regression covariates are available for the modeling. We focus here on the case of modeling survey estimates for a moderate to large number of areas and a small number of time points. Alternative models considered include autoregressive and random walk dependence structures, as well as a bivariate model applied to current estimates and an average of past estimates. Theoretical results indicating the potential for variance reduction by using time series models to borrow information from past data are compared to results obtained for empirical examples.

11:10 Estimating Re-fitting Frequencies for Short-term Energy Models
-- Janice Lent and Rebecca George (U.S. Energy Information Administration)

The U.S. Energy Information Administration (EIA) projects monthly short-term estimates of U.S. energy supply, demand, trade, and prices for its publication Short-Term Energy Outlook (STEO). EIA's short-term energy modeling system is an integrated system of over 400 econometric linear regression and time series models, which are solved using the EViews software package. We present research to determine the necessary updating frequency of the STEO model coefficients. The research involves an innovative method of estimating the model coefficients a selected number of times using different sample periods, storing model coefficients, and computing test statistics to determine the statistical significance of the changes in the model coefficients over time.

11:30 De-mystifying Seasonal Adjustment – a visual tool to help users understand the process
-- Steve Matthews, Nada Habli, and François Verret (Statistics Canada) ****virtual***

Statistics Canada has recently been working to build capacity of data users to work with seasonally adjusted data, particularly results obtained from the X-12-ARIMA method. Due to the complexity of the process, a steep learning curve is required to interpret and understand seasonally adjusted results for those new to the concept. To assist with this, a visual report called the seasonal adjustment dashboard has been developed to provide a digestible summary of the seasonal adjustment process in a given month for a given series of estimates. This has recently been programmed in R-Shiny and is currently being made available internally to assist analysts to interpret and explain seasonally adjusted results. The summary report includes graphs of the series across time, as well as summaries of individual effects and patterns based. As well, a summary of key diagnostics is provided and the net effect of seasonal adjustment is decomposed to the various components. This presentation will demonstrate the visual representation of the process and provide a demonstration of the report and its interactive functionality.

11:50 Questions

1:15 A Diagnostic for Seasonality Based Upon Autoregressive Roots
-- Tucker McElroy (Census Bureau)

Methodology for seasonality diagnostics is extremely important for statistical agencies, because such tools are necessary for making decisions whether to seasonally adjust a given series, and whether such an adjustment is adequate. We connect the concept of seasonality to a mathematical definition regarding the oscillatory character of the moving average (MA) representation coefficients, and define a new seasonality diagnostic based on autoregressive (AR) roots. The diagnostic is able to assess different forms of seasonality: dynamic versus stable, of arbitrary seasonal periods, for both raw data and seasonally adjusted data. An extension of the AR diagnostic to an MA diagnostic allows for the detection of over-adjustment. Joint asymptotic results are provided for the diagnostics as they are applied to multiple seasonal frequencies, allowing for a global test of seasonality. We illustrate the method through simulation studies and several empirical examples.

1:35 Seasonal Adjustment Subject to Frequency Aggregation Constraints
-- Osbert Pang (Census Bureau)

Quarterly seasonal adjustments in official statistics are often not the result of a direct adjustment of the quarterly series, but instead are an indirect adjustment arising from the aggregation of the seasonally adjusted monthly series. However, the temporal aggregation of nonseasonal monthly series to a quarterly frequency can exhibit seasonality; we provide a rigorous framework for understanding how this occurs. To solve the problem, we build on prior work that uses benchmarking to enforce seasonal adjustment adequacy as temporal aggregation is applied, where adequacy is metrized and supplied as a hard constraint to the benchmarking optimization problem. It is vital to use a seasonality diagnostic that examines a time series at high seasonal lags, and can properly capture type I and type II errors, and therefore we propose to utilize new autoregressive seasonality diagnostics in tandem with the proposed benchmarking procedure. We examine the proposed procedure on X-13ARIMA-SEATS seasonal adjustments of several economic time series.

1:55 The Dark Side of the Moon: An Alternative Perspective on Detecting Seasonality
-- Gary Cornwall (Bureau of Economic Analysis)

Seasonality is among the most visible properties in time series data, yet a multitude of statistical tests devised over decades of research have only achieved limited success in its detection. Moreover, residual seasonality, that is seasonal fluctuations which remain post adjustment, has plagued many central statistical agencies in recent years, forcing revisions of historical series and changes to adjustment practices. In this paper we focus on one potential source of residual seasonality; a failure to reject the null hypothesis of no seasonality when the null is false. We show how the variation in classification of series by tests for seasonality, combined with characteristics of the time series, can be exploited by a Random Forest (RF) framework to make more accurate predictions regarding the seasonal status of a series. Our method produces a substantial reduction in Type II errors, thus addressing the topic of residual seasonality through the testing channel.

2:15 Understanding the Relationship Between the Seasonal Regression Model-based F Test and a Diagnosis of Residual Seasonality
-- Kathleen McDonald-Johnson and Demetra Lytras (Census Bureau)

Residual seasonality—an identifiable seasonal pattern remaining after seasonal adjustment—has long been a concern at the U.S. Census Bureau. Scrutiny of a perceived residual pattern in the gross domestic product has focused attention on the best ways to diagnose the phenomenon so analysts can improve their seasonal adjustments. One promising diagnostic is the model-based F test from fitting seasonal regressors to the seasonally adjusted time series. The same time series can have contradictory results, however, depending on the ARIMA part of the model. We investigated, using X-13ARIMA-SEATS to fit a variety of models to seasonally adjusted series, and we present the results.

2:35 Questions

1:15 Reference Week Adjustment of Employment Insurance Statistics
-- Lorcan Mischler (Statistics Canada)

The Employment Insurance (EI) Statistics program at Statistics Canada releases monthly seasonally adjusted statistics such as the number of beneficiaries and claims received. Before recent legislation, beneficiaries had a waiting period of two weeks before receiving EI benefits and an adjustment was made for the calendar effect introduced by the location of the reference week using a linear RegARIMA model. Recently, legislation changed the waiting period to one week. This talk will present two approaches considered for improving the estimation of the calendar week effect: one using different RegARIMA regressors and one using a more detailed data source.

1:35 Comparison of Methods to Estimate Holiday Effects in Weekly Data
-- Thomas D. Evans and Michael Sverchkov (Bureau of Labor Statistics)

Estimating holiday effects with weekly data is difficult since almost all holidays are “moving.” BLS adjusts weekly unemployment insurance claims data where numerous holidays cause much of the variation in week-to-week change. Currently, holidays are modeled deterministically with a regression model, but most of the issues with our adjustments are due to increased variability around holidays. These holiday effects can also be estimated stochastically, as additive outliers, or with missing values. Comparisons will are made here for the different approaches for estimating holiday effects.

1:55 Seasonal Adjustment of Tricky Time Series
-- Demetra Lytras (Census Bureau)

While the seasonal adjustment of many economic time series can be fairly straightforward, some series have unusual characteristics that make adjustment more complicated. This presentation examines a handful of these time series, showing how they differ and suggesting avenues within X-13ARIMA-SEATS for their adjustment.

2:15 Extreme Value Modeling with a Look Towards Outlier Detection and Adjustment in Time Series
-- Anindya Roy and Tucker McElroy (Census Bureau)

We consider the problem of extreme value adjustment in time series. We use a scaled multivariate-t (or skew-t) process to capture features of a process that exhibits extremely large values as well as meager values. The main motivation of the modeling exercise is to use the technique as a tool for dealing with outliers in the seasonal adjustment process. Thus, the model is used as a generative model for outliers. We demonstrate the utility of the model using real time series as well as simulated data.

2:35 Questions

3:00 Quarterly Services Survey Seasonal Adjustment Expansion
-- Karlesha G. LeGrier and Eric Valentine (Census Bureau)

The Quarterly Services Survey (QSS) is a principal economic indicator that produces quarterly revenue estimates for selected service industries. QSS began publishing not seasonally adjusted estimates in 2004 and introduced seasonally adjusted estimates in 2008. QSS expanded the number of seasonally adjusted series from 12 to 38 with its fourth quarter 2018 release – the first introduction of new seasonal series in six years. QSS continues to research the seasonality of additional series using X-13ARIMA-SEATS, with plans to expand to additional sectors. We will discuss the phased, sector-based approach to expansion and seasonal adjustment review methodology.

3:20 A Plan for Examining Signal Extraction of the Manufacturers' Shipments, Inventories, and Orders (M3) Survey
-- James Livsey and Colt Viehdorfer (Census Bureau)

The M3 survey conducted by the U.S. Census Bureau is a monthly indicator survey that provides data on economic conditions in the domestic manufacturing sector. We currently produce seasonally adjusted estimates from the survey using X-11 methodology. However, we plan to explore two modern model-based signal extraction techniques to expand upon prior work and to identify practical applications; multivariate methods and model-based seasonal adjustment. Our multivariate approach will utilize the custom Ecce Signum software developed at the Census Bureau and allows the M3 survey aggregate series to be viewed jointly by the lower level composition series. We also implement the Signal Extraction in ARIMA Time Series (SEATS) approach on univariate series. We show our plan for comparing and contrasting the seasonally adjusted estimates and components versus the current X-11 methodology and include some preliminary results.

3:40 The New Kid on the Block: Introduction to Business Formation Statistics
-- Samantha Nguyen and Erin Wrona (Census Bureau)

The Business Formation Statistics is a new experimental data product that provides high frequency, timely data on business startups. National, regional and state-level data is released on a quarterly basis, filling the need for analyzing business statistics with minimal lag. We seasonally adjust these 510 new series in R, using the seasonal package. BFS is the first production economic data product to use R for seasonal adjustment, so we will look at the differences in our quarterly processing and annual review. Finally, we will present preliminary work on a new, user-defined holiday, and discuss some future projects including weekly seasonal adjustment and releasing industry-level data.

4:00 Questions

3:00 Seasonal Adjustment in Statistics New Zealand (StatsNZ)
-- Richard Penny and Erin Mansell (Statistics New Zealand) ****virtual***

StatsNZ has been producing seasonally adjusted time series for 40 years using variations of the Census II Method. New Zealand, being a small country (5 million people, GDP $200 billion) with a strong agricultural and tourist component to the economy, has specific methodological issues that require investigation to enable production of sound outputs. In addition StatsNZ is commensurately small in size so considerations of efficiency and time series knowledge acquisition and maintenance have to be resolved within the broader skillsets required of StatsNZ methodologists.

3:20 Constrained Seasonal Adjustment for Correlated Series: How the Fed Seasonally Adjusts Liquid Bank Deposits
-- Mary-Frances Styczynski and Brian Preslopsky (Federal Reserve Board)

In 1994, the Federal Reserve began allowing banks to transfer customer deposits from checking accounts to savings accounts to avoid reserve requirements. As these so-called “retail sweep” programs grew in size and number, they destabilized normal seasonal patterns related to checking account payment flows, and created new, negatively correlated seasonal patterns in the recipient savings deposit series. The sum of these series, however, retained much more stable seasonal patterns. The Fed remedies this issue by seasonally adjusting the component series and their sum and then using a custom software algorithm to constrain these sets of seasonal factors to converge.

3:40 Showdown at the SAPW! - Forecasts versus Published Data
-- Elijah L. Hood and Catherine C.H. Hood (Catherine Hood Consulting)

One of our services at Catherine Hood Consulting is to send one-step-ahead forecasts of various seasonally adjusted series to our clients who trade in the financial markets ahead of press releases. During our periodic review, we want to compare our forecasts to the first published value, using the diagnostics available in X-13, history-style graphs, and average and absolute average percent differences. We are especially interested in checking for possible seasonality or other patterns in the percent differences. The goal is to share any patterns we find with clients so they can improve their forecasts.

4:00 Questions