

Improvements to CPI Procedures for Intervention Analysis Seasonal Adjustment

In February 1997, the Bureau of Labor Statistics (BLS) will begin using a new seasonal adjustment program for the seasonal adjustment of Intervention Analysis Seasonal Adjustment (IASA) series. This change will be made for both the Consumer Price Index and Producer Price Index series. The new seasonal adjustment program is called X-12-ARIMA and is a product of the Bureau of the Census. It will replace X-11-ARIMA and RAMP intervention analysis software for the IASA series. In February 1998, BLS will begin using X-12-ARIMA for the seasonal adjustment of all Consumer Price and Producer Price Index series. The later conversion of non-IASA series to X-12-ARIMA seasonal adjustment is due to operational constraints.

The Bureau of Labor Statistics has provided seasonally adjusted data since 1966. The first seasonal adjustment method used was the BLS Seasonal Factor Method. In 1967, the Bureau of the Census introduced the X-11 Variant of the Census Method II Seasonal Adjustment Program, otherwise known as X-11. By the early 1970s, most seasonal adjustment at BLS was done using X-11. In 1980, BLS adopted X-11-ARIMA for most official seasonal adjustment. The X-11-ARIMA software was developed by Statistics Canada and provided the option of using ARIMA (autoregressive integrated moving average) modeling and forecasting techniques to extrapolate extra data at the end of a time series before seasonal adjustment. The result was more accurately estimated seasonal factors for data at the end of the series. A later (1988) version of the X-11-ARIMA software has been used since 1994. Intervention analysis seasonal adjustment techniques, developed at BLS, have been used in conjunction with X-11-ARIMA for the adjustment of CPI and PPI series since 1989. The IASA software is called RAMP (Ramp Adjustment Management-System for the PPI).

The X-12-ARIMA seasonal adjustment program is a further enhancement of the X-11 program. It incorporates the ARIMA techniques introduced by Statistics Canada, along with a variety of new tools to overcome adjustment problems. The most important contribution of X-12-ARIMA is the introduction of more flexible time series modeling through the use of regression techniques. The new regression-ARIMA combination models are called regARIMA

models. Built-in regressors are available for directly estimating holiday effects, sudden level changes, and other disruptions to the series whose effects need to be temporarily removed from the data before the X-11 methodology can adequately estimate seasonal adjustments. The X-12-ARIMA software also allows the use of user-defined regression variables to handle cases not explicitly provided for. When no regressors are used, the regARIMA model collapses to a standard ARIMA model. The X-12-ARIMA software also provides an extended set of diagnostics to help the user detect and remedy any inadequacies in the seasonal adjustment.

The X-12-ARIMA seasonal adjustment program is available in the public domain on the Internet at <ftp.census.gov> in the directory `pub/ts/x12a`. Complete documentation may be found there.

For those series adjusted using intervention analysis seasonal adjustment, we expect the resulting seasonal factors to be similar to the factors obtained using X-11-ARIMA with the RAMP intervention analysis software. X-12-ARIMA is able to include ramps, level shifts, outliers, and seasonal shifts in modeling the series. The effects of these nonseasonal movements are temporarily removed from the series for the calculation of the seasonal factors. This procedure keeps the seasonal factors from being unduly influenced by large index movements that are not seasonal in nature. We expect the additional diagnostic tools and the flexibility of the X-12-ARIMA modeling facility to allow BLS to further improve the seasonal adjustments of difficult series.

In order to provide users of BLS data with an estimate of the effect of adopting X-12-ARIMA for intervention analysis seasonal adjustment, BLS has calculated the seasonal adjustments of All items and All items less food and energy using seasonal factors calculated using X-12-ARIMA for components of the seasonally adjusted All items index that are affected by this change. Please see table 1 for a comparison of the resulting derived seasonal factors, and charts 1 and 2 for a comparison of the resulting 1-month seasonally adjusted percent changes.

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Table 1. Seasonal factors for all items and all items less food and energy as calculated and published in January 1996, and as calculated using X-12-ARIMA for intervention analysis series, 1995

(CPI-U, U.S. city average)

Month	All items		All items less food and energy	
	X-11-ARIMA with RAMP	X-12-ARIMA	X-11-ARIMA with RAMP	X-12-ARIMA
1995:				
January	99.801	99.801	99.749	99.686
February	100.000	100.000	100.063	100.063
March	100.066	100.066	100.187	100.187
April	100.066	100.066	100.062	100.062
May	100.000	100.000	99.938	99.876
June	99.934	100.000	99.752	99.752
July	99.869	99.869	99.629	99.629
August	99.935	99.935	99.753	99.753
September	100.000	100.000	99.815	99.815
October	100.000	100.000	99.939	99.939
November	99.870	99.870	99.939	99.939
December	99.611	99.611	99.633	99.633

Chart 1. Seasonally adjusted 1-month percent changes during 1995 for the CPI-U, U.S. city average, All items and effect of 1996 software change for intervention analysis series

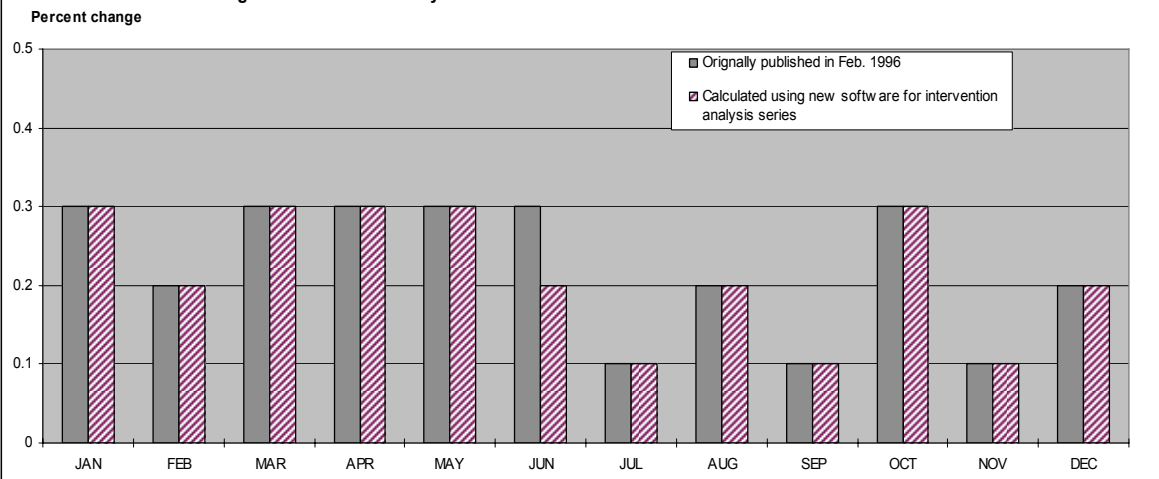


Chart 2. Seasonally adjusted 1-month percent changes during 1995 for the CPI-U, U.S. city average, All items less food and energy, and effect of 1996 software change for intervention analysis series

