

Systematic Approach to Seasonal Adjustment of Time Series Data: Methods and Example

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There have been three primary methods in the world of seasonal adjustment. The first one is the X-12-ARIMA based filter (also referred to as x11 smoothing) developed by the United States Census Bureau. This technique has been used by statistics-based governmental agencies in US, United Kingdom, Australia, Canada, and other international agencies. The second technique is ARIMA model-based signal extraction (also referred to as SEATS), developed primarily by the Bank of Spain. This technique has been used by many organizations in Europe and elsewhere. The third method is called the structural model-based decomposition (also referred to as UCM). It has been implemented in popular statistical software such as SAS, STAMP, and STATA, as well as in open-source statistical software, but has not been widely used by the agencies. Each of the three methods has advantages and disadvantages for specific situations. In this paper, I propose a hybrid and systematic way to do the seasonal adjustment by combining these three methods. Data of monthly retail sales of consumer goods in China from January 2000 to December 2011 is used for analysis. Results show that for the given time series, if a desired time series model can be built, then seasonal adjustment results with these three methods are very similar. Otherwise, a systematic approach that recursively applies these methods is suggested. SAS software is used to illustrate and account for seasonal factor adjustments. Finally, general recommendations for systematic approaches to seasonal adjustment are discussed.

Keywords: Seasonal adjustment, X-12-ARIMA, SEATS, UCM.