

The AIA Work-on-the-Boards Survey and the Architectural Billings Index (ABI)

The ABI Seasonal Adjustment

Beginning in late 1995, the American Institute of Architects (AIA) assembled a panel of architecture firms to participate in an ongoing national survey to measure their business conditions. The principal purpose was to develop a database of national and regional business trends at architecture firms so that an individual firm would have a better sense of how business at that firm compared with its peers.

Every year the ABI is updated with the seasonal adjustment procedures for monthly time series estimate effects that occur in the same calendar month with similar magnitude and direction from year to year. An economic time series is a sequence of successive measurements of an economic activity (that is, variable) obtained at regular time intervals (such as every month or every quarter). The data must be comparable over time, so they must be consistent in the concept being measured and the way that concept is measured. The seasonal adjustment is the process of estimating and removing seasonal effects from a time series in order to better reveal certain non-seasonal features.

Specific to the ABI, certain months of the year—December is typically one of them—are slower at architecture firms due to holidays, weather, and other factors. Other months may show almost uniformly stronger business conditions for just the opposite reasons. To allow for meaningful comparisons among months, the monthly responses are seasonally adjusted using the Census Bureau's X-12 program¹. The seasonal adjustment process regulates the ABI score each month based on typical scores for that month in prior years. So, for example, even though December scores may be weaker than November scores, the seasonal adjustment process compares this weakness to prior years to determine if the decline is stronger or weaker than it has been previously. It is important to note that seasonal factors are estimates based on present and past experience and that future data may show a different pattern of seasonal factors.

Seasonal movements are often large enough that they mask other characteristics of the data that are of interest to analysts of current economic trends. For example, if each month has a different seasonal tendency toward high or low values, it can be difficult to detect the general direction of a time series' recent monthly movement (increase, decrease, turning point, no change, consistency with another economic indicator, etc.). Seasonal adjustment produces data in which the values of neighboring months are usually easier to compare. Many data users prefer seasonally adjusted data because they want to see those characteristics that seasonal movements tend to mask, especially changes in the direction of the series.

¹ X-12-ARIMA (Auto-Regressive Integrated Moving Average) is a seasonal adjustment program developed at the U.S. Census Bureau. More information on [X-12-ARIMA](#) or www.census.gov/srd/www/x12a/

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The Seasonal Adjustment Process

The mechanics of seasonal adjustment process involve breaking down a series into trend-cycle, seasonal, and irregular components.

1. *Trend-Cycle*: Level estimate for each month (quarter) derived from the surrounding year-or-two of observations.
2. *Seasonal Effects*: Effects that are reasonably stable in terms of annual timing, direction, and magnitude. Possible causes include natural factors (the weather), administrative measures (starting and ending dates of the school year), and social/cultural/religious traditions (fixed holidays such as Christmas). Effects associated with the dates of moving holidays like Easter are not seasonal in this sense, because they occur in different calendar months depending on the date of the holiday.
3. *Irregular Component*: Anything not included in the trend-cycle or the seasonal effects (or in estimated trading day or holiday effects). Its values are unpredictable as regards timing, impact, and duration. It can arise from sampling error, non-sampling error, unseasonable weather, natural disasters, strikes, etc.

For instance, original (unadjusted) series, in a year where April value is larger than the March value, but the seasonally adjusted series shows a decrease from March to April. The discrepancy or the difference in direction can happen only when the seasonal factor for April is larger than the seasonal factor for March, indicating that when the underlying level of the series isn't changing, the April value will typically be larger than the March value. The original series' April increase over the March value must be smaller than usual, either because the underlying level of the series is decreasing or because some special event or events abnormally increased the March value somewhat, or decreased the April value somewhat. (When trading day or moving holiday effects are present and are being adjusted out, other explanations are possible.)

Monthly (or quarterly) time series that are totals of daily activities can be influenced by each calendar month's weekday composition. This influence is revealed when monthly values consistently depend on which days of the week occur five times in the month. For example, building permit offices are usually closed on Saturday and Sunday. Thus, the number of building permits issued in a given month is likely to be higher if the month contains a surplus of weekdays and lower if the month contains a surplus of weekend days. Recurring effects associated with individual days of the week are called trading-day effects.

Trading-day effects can make it difficult to compare series values or to compare movements in one series with movements in another. For this reason, when estimates of trading-day effects are statistically significant, the Census Bureau adjust them out of the series. The removal of such estimates is called trading day adjustment.

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The X-12-ARIMA Computer Program

It is difficult to estimate seasonal effects when the underlying level of the series changes over time. For this reason, the program starts by detrending the series with a crude estimate of the trend-cycle. It then derives crude seasonal factors from the detrended series. It uses these to obtain a better trend-cycle and detrended series from which a more refined seasonal component is obtained. This iterative procedure, involving successive improvements, is used because seasonal effects make it difficult to determine the underlying level of the series required for the first step. Crude and more refined irregular components are used to identify and compensate for data that are so extreme that they can distort the estimates of trend-cycle and seasonal factors.

The seasonal factors are divided into the original series to get the seasonally adjusted series. For example, suppose for a particular January, a series has a value of 100,000 and a seasonal factor of 0.80. The seasonally adjusted value for this January is $100,000/0.80=125,000$.

If trading day or moving holiday effects are detected, their estimated factors are divided out of the series before seasonal factor estimation begins. The resulting seasonally adjusted series is therefore the result of dividing by the product of the trading day, holiday, and seasonal factors. The product factors are usually called the combined factors, although some tables refer to them as the seasonal factors for simplicity. For more information on the technical and computation of the X-12 monthly seasonal adjustment method, please visit: [X-12-ARIMA](http://www.census.gov/srd/www/x12a/) or www.census.gov/srd/www/x12a/