Deflation of wholesale sales

Introduction

With the November 2018 release of the Monthly Wholesale Trade Survey (MWTS) results (reference month September 2018), the base year and reference year of the deflated wholesale sales have been updated from 2007 to 2012.

The purpose of this document is to present an overview of the deflation methodology used for producing the volume measures of sales from the MWTS.

Purpose of deflation

Changes in the value of sales collected at current prices (i.e. at the time the sales took place) may be attributable to changes in prices or to changes in quantities sold, or to both. To study the activity of the wholesale sector, it is often desirable to remove the variations due to price changes from the values at current prices in order to obtain an indicator of the changes in the quantities sold, i.e. an indicator of the volume of sales. This process is known as deflation.

Derivation of wholesale sales price indices

The main price indices used to deflate wholesale sales are the selling price indices obtained from the Wholesale Services Price Index (WSPI) program. However, the WSPI data are not available in time to deflate the most recent observations of wholesale sales as the WSPI program produces monthly data that are released on a quarterly basis with about a four-month lag.

It is thus necessary to use derived price indices to extend the WSPI-based ones for the most current months, until the WSPI data become available, at which time the derived price indices are replaced by the WSPI-based ones.

In what follows, we describe how price indices, with base year 2012, are computed for the deflation of wholesale sales. We first describe how the WSPI data are used, and then how the derived price indices are constructed.

Price indices based on the WSPI

From the WSPI program, monthly selling price indices are available at the five-digit North American Industry Classification System (NAICS) industry level. These selling price indices are weighted together using the Paasche formula to obtain a sale price index for each of the wholesale trade industries published by the MWTS. These industries are called “trade groups”.

The weights used to combine the selling price indices into a trade group price index are the proportions of the sales of the five-digit NAICS industries within each trade group. These weights are obtained from the Annual Wholesale Trade Survey (AWTS). They vary from year to year; i.e. the 2012 proportions of sales are used in 2012, those of 2013 in 2013, and so on. For the two most recent years, the last available annual data from the AWTS are used.

Derived price indices

To extend the WSPI-based price indices, a derived price index for each trade group had to be constructed based on assumptions that capture the main elements thought to affect wholesalers’ selling prices. These derived price indices are based on the prices of the commodities traded, and on the proportion of the fluctuations in the exchange rate of the dollar that is immediately passed on to the trade group’s customers.

a) Main assumptions

Wholesalers trade a portion of the total supply in Canada of a commodity. The total supply is the sum of domestic production and imports. A wholesale price index for each commodity traded is obtained by combining a domestic production price index with an import price index.

Wholesalers sell domestically and on export markets with perhaps differentiated prices. It is assumed, however, that they set their prices according to the changes in the prices of the commodities that they trade whether the commodities are exported or not.

It is also assumed that the variations in the price of a commodity are the same across wholesale trade groups. This means that a commodity sold by various trade groups has the same price index, but the weight of that commodity will vary across trade groups.

b) Wholesale commodity prices

A wholesale price index for each commodity is obtained by a weighted combination of a domestic production price index with an import price index.

Most of the domestic production prices are taken from the Industrial Product Price Index program. For some farm products, data from the Farm Product Price Index program are used. The Commercial Software Price Index as well as the Consumer Price Index for *Digital Computing Equipment and Devices*, adjusted for major sales tax changes, are also used.

For the import components, the fixed weighted (Laspeyres) import price indices on a customs basis from the International Trade Price Index program are used.

c) Trade group prices

The commodity price indices are then weighted together using the Paasche formula to obtain a sale price index for each trade group. The weights used are based on information on the proportion of the trade group total sales accounted by each commodity.

d) Adjustment for the exchange rate of the dollar

Many of the import prices used in the derivation of the wholesale commodity price indices fully and immediately reflect the exchange rate fluctuations of the dollar. However, wholesalers do not necessarily adjust their prices immediately to compensate for those fluctuations; generally, they will change their prices to reflect only a proportion of them, and maybe with a lag.

A comparison of the trade groups' price indices with the selling price indices from the WSPI program showed that the price indices for many trade groups required an adjustment to account for the incomplete pass-through of the fluctuations in the exchange rate of the dollar.

These pass-through adjustments were evaluated and applied, when necessary, to the trade group price indices.

These adjusted trade group price indices are the derived price indices.

Derivation of the volume of wholesale sales

Two measures of the total volume of wholesale sales are computed. One is the volume of sales at constant prices, the other is the volume of sales in chained dollars. Both are seasonally adjusted.

Volume at constant prices (Laspeyres formula)

The volume of sales at constant prices uses the relative importance of the products' prices in a previous period, currently the year 2012, to evaluate the change in the quantities sold. This year is called the base

year. The resulting deflated values are said to be “at 2012 prices”. Using the prices of a previous period to measure current activity provides a representative measurement of the current volume of activity with respect to that period.

The price indices used to obtain the volume of sales at constant prices are the extended price indices, i.e. the WSPI-based price indices extended with the derived price indices described earlier.

The nominal (current dollars) sales of each trade group are divided by their respective extended WSPI-based price index, and then the total volume of sales at constant prices is obtained by adding the volume of sales across the 25 trade groups covered by the MWTS.

Chained volume index (Fisher formula)

The chained index of the volume of total sales is the geometric mean of two evaluations of the change in the quantities sold between two consecutive months. One evaluation uses the prices of the previous month to evaluate the change; the other uses the prices of the current month.

Since the general tendency for commodity prices is to increase, the evaluation based on the prices of the previous month tends to overstate the change in quantities; i.e. as price increases, buyers tend to buy more of a cheaper commodity. Therefore, using the prices of a previous period to value the quantities bought currently may lead to an overstatement of the change in quantities.

Similarly, the evaluation of the change in the quantities sold using the prices of the current month will tend to understate the change in quantities as this approach gives more weight to the lower priced commodities than to the higher priced ones.

Hence, the geometric average of the two evaluations of the monthly change in quantities (with the previous and current monthly prices) mitigates these under- and over-statements. The chained index of the volume of total sales thus captures the effect of the most recent price changes in the change in volume, as it combines the changes in volume measured with respect to both the current and previous month’s prices.

The geometric average of the changes in volume of total sales is computed monthly, and then the monthly variations are chained (compounded) to provide a time series of the changes in volumes. The time series is then scaled to be equal to the total value of wholesale sales in current dollars for the year 2012.

As the only monthly price and quantity information available are the price and volume data for the 25 trade groups covered by the MWTS, the chained volume index of sales is only computed for the Wholesale Trade sector as a whole.

Volume of wholesale sales for 2004-2011

Above, we described how the volume of wholesale sales at 2012 prices was obtained for the period starting with January 2012. But the MWTS data based on NAICS begin in January 2004.

In order to provide an as long as possible time series of the volume of wholesale sales, we linked the data for the period 2004 to 2011 at 2007 constant prices (for the Laspeyres series), and at 2007 prices (for the Fisher series), to the current period starting in 2012.

This linking preserves the monthly growth rates of the data published at 2007 prices.