

Sales in volume for Wholesale Trade

Introduction

With the September 2012 release of the Monthly Wholesale Trade Survey (MWTS) results (reference month July 2012), a new deflation methodology for wholesale sales has been implemented.

This new methodology improves on the previous one, and consequently its results are not strictly comparable to those already published, although the overall trends are similar. The CANSIM table 081-0013 containing the previous estimates has been terminated and the improved results can be found in CANSIM table 081-0015.

The purpose of this document is to present the improved methodology for producing the volume measures of sales from the MWTS, as well as highlight the differences from the previous approach.

Purpose of Deflation

Changes in the value of sales collected at current prices (i.e. at the time the sales took place) by the MWTS may be attributable to changes in prices or to changes in quantities sold, or 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 Indexes

To deflate wholesale sales, suitable price indexes must be used. In the new deflation methodology for wholesale sales, the main price indexes used are the selling price indexes obtained from the [Wholesale Services Price Index \(WSPI\) program](#). This program produces monthly data that are released on a quarterly basis with about a four month lag. Hence, they are not available in time to deflate the most recent observations of wholesale sales.

It was thus necessary to construct price indexes to extend the WSPI-based ones for the most current months. The growth rates of these derived price indexes are used until they are replaced by the WSPI-based ones once they become available.

In what follows, we describe how price indexes, with base year 2007, are computed for the deflation of wholesale sales. We first describe how the WSPI data are used and then how the derived price indexes are constructed.

Price indexes based on the WSPI

From the WSPI program, monthly selling price indexes are available at the 5-digit North American Industry Classification System (NAICS) industry level. These selling price indexes are weighted together to obtain a sales price index for each of the wholesale trade industries covered by the MWTS. Those industries are called trade groups.

The weights used to combine the selling price indexes into a trade group price index are the proportions of the sales of the 5-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 2007 proportions of sales are used in 2007, those of 2008 in 2008, and so on. For the two most recent years, the last available annual data from the AWTS are used.

Derived price indexes

To extend the WSPI-based price indexes, derived price indexes 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 indexes 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 a unique price index, but the weight of that commodity varies across trade groups.

b) Wholesale commodity prices

A wholesale price index with base year 2007 for each commodity would be obtained by combining a domestic production price index with an import price index using a 2007 import weight. But since there was no wholesale commodity survey in 2007, the commodity imports' shares were obtained instead from the 2008 Wholesale Origin and Destination of Goods (WODG) data collected on the AWTS.

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 indexes on a customs basis from the [International Trade Price Indexes program](#) are used.

c) Trade group prices

The commodities sold by each trade group, as well as their proportions in the group's total sales, are known from the 2008 WODG results. These proportions are used to combine the wholesale commodity prices into a price index for the trade group's sales. The trade group price indexes are weighted harmonic means of the commodity price indexes.

For a few trade groups selling a wide variety of commodities, we included only those commodities accounting for at least 95% of the group's sales, as the exclusion of the other ones with little weight has essentially no effect on the trade group's price index.

d) Adjustment for the exchange rate of the dollar

Many of the import prices used in the derivation of the wholesale commodity price indexes 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 group price indexes with the selling price indexes from the WSPI program showed that the price indexes for many trade groups required an adjustment to remove a bias caused by the incomplete pass-through of the fluctuations in the exchange rate of the dollar.

These pass-through adjustments were evaluated by a linear regression of the ratio of the trade group price index to the WSPI-based price index on the exchange rate of the dollar vis-à-vis the U.S. currency. The adjusted trade group price indexes are the derived price indexes.

e) An exception

For one trade group, *NAICS 4142 - Home Entertainment Equipment and Household Appliance Wholesaler-Distributors*, it was found that even the adjusted price index was not appropriately tracking the selling price index from the WSPI program.

Hence, for this particular trade group the derived price index is formed instead from a combination of two CPI components, adjusted for major sales tax changes. The two CPI components are those for *Audio Equipment* and *Video Equipment*, which are combined using their weights in the CPI.

Derivation of the Volume of Wholesale Sales

As indicated previously, changes in the value of wholesale sales may be attributable to changes in the prices of the commodities sold, or to the quantities sold, or to both. With deflation, a measure of the volume of sales can be obtained for the analysis of the changes in the quantities sold, removing the effect of price changes.

Two measures of the total volume of wholesale sales are computed. One is the volume of sales at constant prices (with and without seasonal adjustment); the other is the volume of sales in chained dollars (only available 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 2007, to evaluate the change in the quantities sold. This year is called the base year. The resulting deflated values are said to be "at 2007 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 indexes used to obtain the volume of sales at constant prices are the extended price indexes, i.e. the WSPI-based price indexes extended with the derived price indexes described earlier.

The nominal (current dollars) sales of each trade group are divided by their respective extended 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.

The unadjusted and seasonally adjusted volumes at constant prices are computed similarly. In the computation of the seasonally adjusted volume of sales, however, the price indexes are seasonally adjusted directly using the X-12-ARIMA program if appropriate.

Volume in chained dollars (Fisher formula)

The total volume of sales in chained dollars 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 volume of sales in chained dollars 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 total volume of sales in chained dollars 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 2007.

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 volume of sales in chained dollars is only computed for the Wholesale Trade sector as a whole.

As well, it is only produced in seasonally adjusted form, since chaining monthly raw volume variations may result in hard-to-interpret monthly fluctuations.

Improvements over the Previous Methodology

The new methodology for the deflation of wholesale sales brings various improvements to the previous one. These improvements include:

- The use of observed wholesale selling price indexes (when available) instead of derived trade group price indexes.
- When the WSPI data are not available, a pass-through adjustment is applied if necessary to the derived trade group price indexes. There were no such adjustments previously.
- An improved derived price index for the trade group *NAICS 4142 - Home Entertainment Equipment and Household Appliance Wholesaler-Distributors*.
- Where appropriate, seasonal adjustment is performed directly on the trade group price index. Previously, it was the deflated sales of each trade group that were seasonally adjusted directly.
- The base year/reference year has been updated from 2002 to 2007.

Volume of Wholesale Sales for 2004-2006

Above, we described how the volume of wholesale sales at 2007 prices was obtained for the period starting in January 2007. 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 also deflated the period 2004-2006.

For the year 2006, we used the selling price indexes from the WSPI program as described above. The WSPI-based price indexes were extended in the past, for the period 2004-2005, using the derived trade group price indexes described earlier, with a base year of 2002. That is, the shares of imports in the wholesale commodity prices was assumed to be equal to that in the total Canadian supply of that commodity in 2002 according to the [Input-Output Tables](#). As well, the proportions of each commodity in the sales of each trade group were obtained from the 2001 [Wholesale Trade Commodity Survey by Origin and Destination](#), as there was no wholesale trade commodity survey in 2002.

The segment at 2002 prices for the years 2004-2006 was then linked to the level of the segment at 2007 prices, by preserving its monthly growth rates.