

Price index numbers and indexing

Picking the right price index series

Price index numbers are used widely for indexing, or price compensating, wages, rents, contracts, insurance and more. Most of the questions posed to the Central Bureau of Statistics on price index numbers are about indexing.

Depending on the subject, different price index series can be used as a basis for indexing. Sometimes, the specific price index series to be used is determined by law or by a contract. More often, this is not the case and choices have to be made to arrive at the best price index series for specific cases. This choice may be done by one or more of the parties involved, or by (independent) experts. The Central Bureau of Statistics can advise on which series to use, but the actual choice and application are always the responsibility of the user.

Choices have to be made on the following aspects of the price index series:

- Choose total expenditure or a specific expenditure category,
- Choose single-month values or 12-month average values,
- Choose Bonaire, Curaçao, Sint Maarten or the Netherlands Antilles as a whole,

Indexing is mostly applied annually by compensating for overall inflation, the percentage change of the year-average (the December 12-month average) CPI for total expenditure in the past year compared to its corresponding value one year earlier.

Indexing: Identify the periods for which to extract CPI data

Once a specific price index series has been chosen as the basis for indexing, the time frame for indexing has to be chosen. This involves identifying the first and last periods of the time frame, t_f and t_l , and the reference period t_r . The reference period is the period immediately preceding the first period of the time frame, $t_r = t_f - 1$ (examples 1 and 2). In the indexing, the CPI of the last period of the time frame is compared to the CPI of the reference period. Usually, indexing is applied in the period following the last period of the time frame, $t_l + 1$.

Example 1 Identifying the right periods (1)

You want to apply indexing for the rise of food prices in the period April 2001 through January 2007. The first and last periods of the time frame are April 2001 and January 2007 respectively. As you are looking at monthly data, the reference period is March 2001, the month preceding April 2001.

Example 2 Identifying the right periods (2)

Every year in March, you compensate your employees' wages for overall inflation in the preceding year. In March 2008 you want to do this once again and you apply 2007 overall inflation as a correction factor.

Overall inflation in 2007 is calculated as the percentage change of the year-average CPI (for total expenditure) in 2007 compared to the year-average CPI in 2006. Thus, both the first and last periods of the time frame are the (entire) year 2007, and the reference period is the (entire) year 2006. Indexing is achieved by comparing the year-average CPI in 2007 to the year-average CPI in 2006.

If the year-average CPI in 2006 is 99.3 and in 2007 it is 102.3, the multiplication factor for indexing based on overall inflation is: $(102.3 / 99.3) = 1.030$
Expressed as a percentage change: $((102.3 / 99.3) - 1) \times 100\% = +3.0\%$

Indexing: Calculate indexed values

After the previous steps, both the specific price index series to be used and the correct periods for which to extract the CPI data have been chosen. The corresponding CPI data can be found in one of the price index tables on the website of the Central Bureau of Statistics. These CPI data can be entered in a formula to obtain the *indexing percentage* to be applied to the subject to be indexed. The indexing percentage is given by the formula:

$$(1) \quad \text{Indexing percentage} = ((\{\text{CPI in the last period}\} / \{\text{CPI in the reference period}\}) - 1) \times 100\%$$

And this percentage must be applied as follows to the value of the subject to be indexed:

$$(2) \quad \text{Indexed value} = (1 + 0.01 \times \text{Indexing percentage}) \times \{\text{Value in first period of time frame}\}$$

Alternatively, you may find it easier to use an *indexing multiplication factor* instead of the indexing percentage, and apply this to the value of the subject to be indexed:

$$(3) \quad \text{Indexing multiplication factor} = \{\text{CPI in the last period}\} / \{\text{CPI in the reference period}\}$$

$$(4) \quad \text{Indexed value} = \{\text{Indexing multiplication factor}\} \times \{\text{Value in first period of time frame}\}$$

Of course, both alternatives will end up with the same indexed values. The indexing process for a real-life situation is shown in example 3.

Example 3 Indexing for food prices on Curaçao

You want to apply indexing to update the lunch forfeit of employees for the rise of food prices on Curaçao in the period April 2001 through January 2007. The old forfeit was determined in April 2001 and equals \$ 4.00 a day. In example 1 you found the last period of the time frame (January 2007) and the reference period (March 2001).

Indexing is done by comparing the CPI for food on Curaçao in November 2006 to the CPI in March 2001:

CPI food (March 2001) = 74.5

CPI food (January 2007) = 101.5

The *indexing percentage* is $((101.5 / 74.5) - 1) \times 100\% = +36\%$

The *indexing multiplication factor* is $(101.5 / 74.5) = 1.36$

The *indexed value* for the lunch forfeit is $1.36 \times \$ 4.00 = \$ 5.44$

Indexing over periods covered by time series from two or more base periods

The Central Bureau of Statistics starts new price index series about every 5 years. This is done to account for the changing structure of expenditure in households, which appears from budget surveys (see [this document](#)). When this is done, the index for the first month of the new price index series, the base period, is set to 100 and all price index numbers from that time on are calculated relative to this base period. For example, for the present price index series for the islands of the Netherlands Antilles, October 2006 is the base period; these series are therefore indicated as the October 2006 = 100 series.

The Central Bureau of Statistics recalculates price index numbers from older series, so that all price index numbers published on the website are relative to the value 100 in the present base period (October 2006 = 100). This process is called *chaining* or *rescaling* index series. Thus, users can use price index data from longer time periods 'as is' without having to worry over how to chain the index numbers from different base period time series. The recalculation of an older price index time series is done by dividing all values of the older time series by the price

index of that time series in the new base period (and then multiplying again by 100, the new value in the base period), as can be seen in example 4. Alternatively, price index series can be recalculated to any older base period, such as February 1996 = 100.

For indexing purposes, it is indifferent which base period time series is used, as long as the CPI values for **both** the last period of the time frame and for the reference period are taken relative to the **same** base period. The indexing is indifferent to the base period used, because the ratio of values for the same period from the time series with different base periods is a constant (example 5).

Example 4
Rescaling the Curaçao February 1996 = 100 price index time series for total expenditure to October 2006 = 100

The February 1996 = 100 CPI series was started (as the name shows) in February 1996 with index values of 100 for total expenditure, as well as for all underlying product groups. At the time when the new time series was introduced, in October 2006, the CPI for total expenditure from the February 1996 = 100 time series was 127.9.

The February 1996 = 100 time series is rescaled to the October 2006 = 100 time series by dividing all values of the February 1996 = 100 time series by 127.9 and then multiplying again by 100. The rescaled value for October 2006 is 100 and for February 1996 it is 78.2.

Example 5
Indexing based on time series with different base periods

The CPI values in example 3 were taken from the time series of food on Curaçao with base period October 2006 = 100. Alternatively, we can take the corresponding CPI values from the time series with base period February 1996 = 100:

CPI food (March 2001) = 116.6

CPI food (January 2007) = 158.9

The *indexing multiplication factor* is $(158.9 / 116.6) = 1.36$

The *indexed value* for the lunch forfeit is $1.36 \times \$ 4.00 = \$ 5.44$

All CPI values for food on Curaçao from the February 1996 = 100 time series are a factor 1.566 larger than their corresponding values from the October 2006 = 100 time series. This factor is in fact the CPI value for food from the February 1996 = 100 time series in the month October 2006, divided by 100 (where 100 is the corresponding CPI value from the October 2006 = 100 time series).