



SPLICING OF THE CPI SERIES AND THE ADJUSTABILITY FACTOR

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Introduction

The changes in the base year of the Consumer Price Index (CPI) signify that the series published based on the index are no longer available to users. These temporary ruptures of the index are resolved by splicing (connecting or uniting) the levels of previous base years to the level of the new base year and maintaining the published variations.

The CPI series, available from March 1928 to the present, present a rupture in the year 2009, when the change in base year modified the geographic coverage¹ and the base period of the index changed from a month base to a year base. Given these changes, it is not methodologically recommendable to splice the series previous to base year 2009 with the later changes to the base year.

Given the above, there are two CPI series: a) from March 1928 to December 2009, with a base year 2008=100, and b) from January 2010 to the present with a base year 2013=100. Nevertheless, monthly price variations obtained with both series are official².

It should also be indicated that nothing was done to make the series previous to 2009 methodologically comparable because the CPI could not be corrected and the variations published monthly are official. The splicing, in periods in which it can be applied, is done at the level of the index and not for any lower levels (e.g. divisions or subclasses).

This document is divided in two parts. The first presents the splicing of the CPI series and the second presents the adjustability factor.

¹ Until December 2009, the geographic coverage of the index only extended to the "Greater Santiago" region. After that date, the IPC 2009=100 has broadened the coverage to a national level, including the 15 regional capitals and their conurbation zones.

² The splicing series are available on the INE website.

1. The splicing of the CPI series

Because of the methodological changes of the CPI base 2009=100 (i.e. changes in national coverage and base year), the previous series up to and including December 2009 cannot be spliced with series published since January 2010. Therefore, INE has given users two CPI series:

- a) Splicing series of the index from March 1928 to December 2009 with base year December 2008=100
- b) Splicing series of the index from January 2010 to December 2013 with base year 2013=100

To splice (connect) the series of CPI base 2013=100 with the CPI base 2009=100 (which covers the period from January 2010 to the present) the **splicing factor** is constructed as follows:

$$\text{Splicing factor} = \frac{\text{CPI}_{\text{base 2013}}^{\text{December 2013}}}{\text{CPI}_{\text{base 2009}}^{\text{December 2013}}}$$

The splicing factor rescales the level of the index base 2009=100³ to the level of base 2013=100. With this splicing factor, the officially calculated variations are maintained and published by INE for the CPI with the previous base during the period from January 2010 to December 2013. The moment of transition, when the new base year became official (between December 2013 and January 2014), reflects the variation of prices calculated with the new base year.

The indices of prices for 2013 of the new base year are not used because the basket is referential and its price variations are not official, although INE has made the series available to users.

Therefore, the monthly values of the index of base 2009=100 are multiplied by the splicing factor and the result is the CPI series with base 2013=100. To obtain the index for the month of December 2009, the variation of the prices of January are used and anchored to the level of the index for that month.

³ For the indices of 2013 to be equal to 100, the series must be rescaled, dividing each monthly index by the mean of the indices of 2013 with base year 2009 (the official series up to 31 December, 2013).

The splicing of the series of base 2013=100 with the previous base year is carried out at the Division level.

2. Adjustability factor

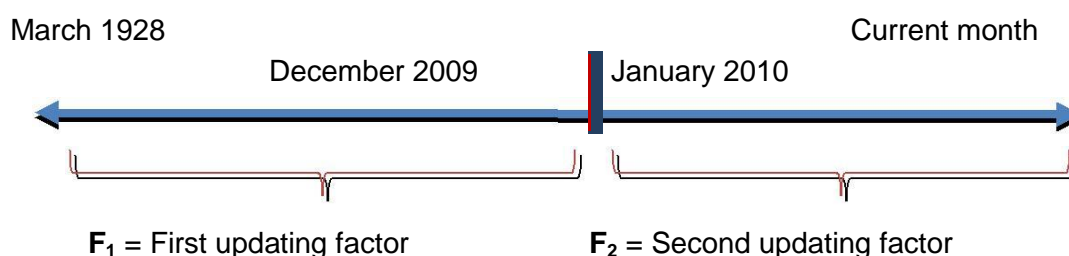
Whenever a user needs to adjust (or update) a monetary value⁴, there arise three possible situations:

- The update covers a period previous to December 2009 and subsequent to January 2010.
- The update covers a period subsequent to January 2010.
- The update covers a period previous to December 2009.

2.1 Updates covering periods previous to December 2009 and subsequent to January 2010

When a user requires price variations whose range of beginning and end dates includes December 2009, the adjustment method for values must be used. This policy was established by Supreme Decree No. 322 of 28 December 2009 of the Ministry of Economy, published in the Official Gazette on 29 January 2010.

The Supreme Decree indicates that the adjustment factor (F) is obtained using two updating factors, F_1 for the period previous to December 2009 and F_2 for the periods subsequent to January 2010. This is represented schematically in the following figure.



$$\text{Updated quantity}_1 = \text{Initial quantity} * F_1 \text{Final sum} = \text{Updated quantity}_1 * F_2$$

⁴ INE has a calculator which permits users to carry out updates <http://encina.ine.cl/CALCULADORA/>.

Where:

F_1 is used for the period previous to December 2009 (entre March 1928 and December 2009). It is constructed as follows:

$$F_1 = \frac{CPI_{base\ December\ 2008}^{December\ 2009}}{CPI_{base\ December\ 2008}^{m-1,a}}$$

Where:

m = the initial month of calculation

a = the initial year of calculation

F_2 is used from January 2010 and is constructed as follows in the equation:

$$F_2 = \frac{CPI_{base\ year\ 2013}^{n,t}}{CPI_{base\ 2013}^{December\ 2009}}$$

Where:

n = the final month of the calculation

t = the final year of the calculation

The index of December 2009 in the base 2009 rescaled to the level of 2013 is used as a denominator of F_2 because officially the base year (and the variations obtained by it) is 2009=100.

Example No. 1: The amount of \$150,000 needs to be updated from December 1991 December 2013.

To do the calculation the indices in the table below are required.

	Base year 2008=100	Base year 2013=100
November 1991	39.026	
December 2009	98.620	90.00
December 2013		101.00

The calculation proceeds with the following manner:

- a) The calculation of updating factor (F_1) of the value of December 2009, from December 1991⁵ with base December 2008=100

$$F_{Dec\ 2009} = \frac{CPI_{Dec\ 2009}}{CPI_{m-1,a}}$$

$$F_{Dec\ 2009} = \frac{CPI_{Dec\ 2009}}{CPI_{m-1,a}} = \frac{98.62}{39.025} = 2.52703326 \rightarrow 152.703\%$$

- b) Calculation of the amount (M) updated to December 2009

$$M_{Dec\ 2009} = M_{m,a} * F_{Dec\ 2009}$$

$$M_{Dec\ 2009} = M_{m,a} * F_{Dec\ 2009} = 150,000 * 2.52703326 = 379,054.989$$

- c) Calculation of updating factor (F2) of the value of December 2013 with base 2009=100

⁵ When calculations of updates are done manually, the index from the previous month is used to start the calculation because it represents the current price levels at the beginning of the calculation. When the calculator is used, available at the INE website, the beginning month must be indicated instead of the previous month.

$$F_{n,t} = \frac{CPI_{n,t}}{CPI_{Dec\ 2009}}$$

$$F_{n,t} = \frac{CPI_{n,t}}{CPI_{Dec\ 2009}} = \frac{101.00}{90.00} = 1.22222222 \rightarrow 22.222\%$$

d) Calculation of the amount (A) updated to December 2013

$$A_{n,t} = M_{Dec\ 2009} * F_{n,t}$$

$$A_{n,t} = M_{Dec\ 2009} * F_{n,t} = 379,054.989 * 1.222222222 = 463,287.9910$$

Therefore, the \$150,000 from December 1991 to December 2013 is equivalent to \$463,288.

2.2 Updates for periods subsequent to January 2010

When a user needs to update (adjust) a quantity of money in a period subsequent to 2010, the amount is multiplied by an adjustability factor.

The adjustability factor, taking a value in pesos from month “m” of year “a” (with base 2013=100) to month “n” of year “t” (with base 2013=100), is obtained in with the following equation.

$$F_{n,t} = \frac{CPI_{year\ "t"}^{month\ "n"}}{CPI_{base\ 2013}^{month\ "m-1"}}$$

Note that this adjustability factor is F_2 of section 2.1.

This factor is multiplied by the quantity to update and is obtained as a result of the quantity of money in month “n” at prices of year “t”.

Example No. 2: The amount of \$150,000 needs to be updated from March 2010 to October 2013, given an index of 91.25 for February 2010 and 100.01⁶.

$$F = \frac{100.01}{91.25} = 1.096$$

⁶ The indices of base 2013 are fictitious. They are only used to illustrate how to do the respective calculations.

Therefore, the \$150,000 of March 2010 corresponds to \$164,400 in October 2013.

2.3 Updates for periods previous to December 2009

When a user needs to update (adjust) a quantity of money in a period previous to December 2009, the amount is multiplied by the following adjustability factor:

$$F_{n,t} = \frac{CPI_{year\ "t"}^{month\ "n"}}{CPI_{base\ 2008}^{month\ "m-1"}}$$

Note that this adjustability factor is F_1 , which can be found in section 2.1.

This factor is multiplied by the amount to update and is obtained as a result of the quantity in month "n" at prices for year "t".

Example No. 3: The amount of \$150,000 needs to be updated from June 1930 to July 2008. The index of May 1930 is 0.000000484878 and the index for July 2008 is 98.487⁷.

$$F = \frac{98.487}{0.000000484878} = 203,117,072.748196$$

Therefore, \$150,000 of June 1930 corresponds to \$30,467,560,912,230 in July 2008.

⁷ The values used in this example are published on the INE website.