Hotel Price Index (HPI). Base 2008

(as of January 2009)

Methodological note

INSTITUTO NACIONAL DE ESTADISTICA

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The *Hotel Price Index*, HPI, is a statistical measurement of the monthly evolution of the prices that hotel businesspersons apply to their clients.

Information from the Tourist Accommodation Occupancy Survey is used to obtain this: Hotel Establishments (HOS), with the information that is collected monthly, from some 10,900 establishments in the summer and some 9,200 in the winter, to which a questionnaire is sent. From this questionnaire, information is obtained regarding hotel occupancy (guests registered, overnight stays, occupancy rate, etc.), structure (bedplaces, personnel, etc.) and the rest of the variables of interest, with a broad breakdown by geography and by establishment category. The questionnaire requests, among other variables, the ADR (Average Daily Rate), or average daily fee, applied to different types of client, for a double room with a bathroom. These fees are broken down according to the type of client to which they have been applied:

- Traditional tour operators
- Traditional travel agencies (including hotel vouchers and checks)
- Companies
- Individuals
- Groups
- Direct hiring on the hotel website and/or the hotel chain website
- Online tour operators
- Online travel agencies
- Others

This breakdown by type of client, as well as the introduction of the ADR concept in the section on prices in the HOS questionnaire, is an innovation introduced in January 2008. Until that time, data had been requested regarding prices, broken down by type of fee (see the methodology of the HPI, base 2001).

Both improvements have been introduced in order to respond to the changes occurred in the sales and distribution channels of the hotel sector that have been generated by Internet use (for example, online travel agencies and tour operators, or direct hiring on hotel websites), and to employ the price variables used by said sector and which are available in the management systems of hotel establishments.

These innovations require a base change in the HPI, to introduce in the computation of the index, a new breakdown by type of client, as well as the use of the ADR, the average daily fee, as an indicator of price.

Unlike the Consumer Price Index (CPI), the HPI is an indicator from the perspective of supply, as it measures the evolution of the prices that hotel establishments actually receive, invoiced to all types of client (the CPI only considers the prices applied to households resident in Spain). Therefore, it does not measure the evolution of prices paid by households, nor the official fee applied by hotel establishments, but rather the behaviour of the prices invoiced by the hotel establishments to different types of client, and through different distribution channels (households, companies, travel agencies and tour operators, whether traditional or online).

Indices and interannual variation rates are calculated and disseminated for the 17 Autonomous Communities, Ceuta and Melilla, in addition, indices and rates are published for the different categories on a national level.

Computation of the HPI, base 2008

The improvements introduced do not alter the foundations of the methodology used in the computation of the HPI, that is:

- The formula used is a chain-linked Laspeyres index.
- Simple geometrical averages are used to aggregate the prices of the establishments.
- Different weightings are calculated for each month.

For the year 2009, the simple indices are obtained as the relationship between the average price of reference month *m* and the average price in the same month of the base year, for each province/category/client:

$$_{m(08)}I_{jkt}^{m(09)} = \frac{\overline{M}_{jkt}^{m(09)}}{\overline{M}_{jkt}^{m(08)}} \cdot 100 = \frac{precio\ medio\ del\ cliente_t\ \ categoría_k\ \ provincia_j\ \ en\ el\ mes\ m\ del\ año\ 2009}{precio\ medio\ del\ cliente_t\ \ categoría_k\ \ provincia_j\ \ en\ el\ mes\ m\ del\ año\ 2008} \cdot 100$$

In order to compute the HPI, base 2008, in month *m*, of year 2009, the weighted simple indices are aggregated.

The weightings are calculated on a level of province, establishment category and type of client, that is, at the same level of detail as the simple indices, and they represent the percentage of income received by the hotels for the rooms occupied, by type of client, in a category and in a province, over the total income:

$$_{m(08)}L_{jkt} = \frac{\overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}{\sum_{j,k,t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}$$

where $\widehat{B}_{jkt}^{m(08)}$ is the estimation of the total number of rooms occupied of the establishments of category *k* and province *j*, sold to type of client *t*, in month *m*, of base year 2008.

$$\widehat{B}_{jkt}^{m(08)} = \left(\sum_{i=1}^{e_{jk}} B_{ijk}^{m(08)} \cdot A_{ijkt}^{m(08)} \right) \cdot f_{jk}^{m(08)}$$

where:

. $B_{ijk}^{m(08)}$, is the rooms occupied in establishment *i*, of category *k*, of province *j*, in reference period *m(08).*

. $A_{ijkt}^{m(08)}$, is the percentage of rooms sold to type of client *t*, in establishment *i*, of category *k*, of province *j*, in period *m(08).*

. $f_{jk}^{m(08)}$, is the elevation factor in stratum *jk*, calculated as the quotient of the population rooms available of stratum *jk*, among the rooms available of the sample in that same stratum, in period *m(08).*

. e_{jk}, represents the group of establishments of the sample of stratum *jk*, which have responded to the questionnaire, in period *m(08).*

These weights are aggregated subsequently (*W*) by category, type of client, province or Autonomous Community, according to the aggregated index desired.

Thus, for example, in order to computer the HPI on a national level:

$$_{m(08)}IPH^{m(09)} = \sum_{j}\left(\sum_{k}\left(\sum_{t} {}_{m(08)}I_{jkt}^{m(09)} \cdot {}_{m(08)}W_{jkt}\right){}_{m(08)}W_{jk}\right) \cdot {}_{m(08)}W_{j}$$

where

$$_{m(08)}W_{jkt} = \frac{\overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}{\sum_{t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}} \qquad _{m(08)}W_{jk} = \frac{\sum_{t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}{\sum_{k,t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}} \qquad _{m(08)}W_{j} = \frac{\sum_{k,t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}{\sum_{j,k,t} \overline{M}_{jkt}^{m(08)} \cdot \widehat{B}_{jkt}^{m(08)}}$$

The index expressed is a pure Laspeyres index, and as of 2010, a chain-linked Laspeyres index will be used in the computation of the HPI. This thereby guarantees the continuous updating of the structure used in the weighting of the indices, as the weightings are always calculated with data referring to the immediately preceding year. In order to ensure the comparability of the data obtained with different structures, a chain-linked index is used, which eliminates the need to calculate linking coefficients for each update carried out.

The use of a chain-linked Laspeyres index does have some inconveniences, such as:

. The lack of additivity: it is not possible to obtain a chain-linked index from any aggregate as the weighted average of the chain-linked indices that comprise it.
. Loss of inter-monthly comparison: this comparison is no longer possible, given that each month, different structures have been used for its computation. Only interannual variation rates can be calculated for the HPI to analyse the evolution of hotel prices.

As of January 2010, the HPI will be computed using the following mathematical expression (the national index as a category is used as an example):

Year 2010:

$$_{m(08)}IPH_k^{m(10)} = {}_{m(09)}IPH_k^{m(10)} \cdot \frac{{}_{m(08)}IPH_k^{m(09)}}{100} = \left(\sum_j \left(\sum_t {}_{m(09)}I_{jkt}^{m(10)} \cdot {}_{m(09)}W_{jkt} \right) \cdot {}_{m(09)}W_{jk} \right) \cdot \frac{{}_{m(08)}IPH_{kt}^{m(09)}}{100}$$

Year 2011:

$$_{m(08)}IPH_k^{m(11)} = {}_{m(10)}IPH_k^{m(11)} \cdot \frac{{}_{m(08)}IPH_k^{m(10)}}{100} = {}_{m(10)}IPH_k^{m(11)} \cdot \frac{{}_{m(09)}IPH_k^{m(10)}}{100} \cdot \frac{{}_{m(08)}IPH_k^{m(09)}}{100}$$

In general, for any T greater than or equal to 2010:

$$_{m(08)}IPH_k^{mT} = 100 \cdot \prod_{b=2009}^{T} \frac{{}_{m(b-1)}IPH_k^{sb}}{100}$$

being the general expression for the calculation of the weightings

$${}_{m(T-1)}L_{jkt} = \frac{\overline{M}_{jkt}^{m(T-1)} \cdot \widehat{B}_{jkt}^{m(T-1)}}{\sum_i \sum_j \sum_t \overline{M}_{jkt}^{m(T-1)} \cdot \widehat{B}_{jkt}^{m(T-1)}}$$

Base change. Linked series.

Due to this base change, it is necessary to calculate linking coefficients that avoid the break in the series already published in base 2001. These coefficients are calculated for the aggregates published, maintaining the interannual variation rates disseminated.

With the base change, all of the indices of the year 2008, base 2008, are equal to 100. By retroactively applying the interannual variation rates published month by month, the series is reconstructed to January 2001, with base 2008.

$$IPH_{m,07}^{(enlazado)Base\,2008} = \frac{IPH_{m,08}^{Base\,2008}}{1 + \frac{TV_m^{07,08}}{100}} \qquad IPH_{m,a}^{(enlazado)Base\,2008} = \frac{IPH_{m,a+1}^{(enlazado)Base\,2008}}{1 + \frac{TV_m^{a,a+1}}{100}}$$

This avoids the break caused by the new HPI system, and achieves the comparability of the series.

The complete series of the HPI in base 2001 (until December 2008) and in base 2008 are available to the user on the INE website (http://www.ine.es/en/welcome_en.htm).