

Hotel Price Index (HPI)

Base 2001

**(from January 2001 to
December 2008)**

Methodological note

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The *Hotel Price Index*, HPI, is a statistical measure of the monthly development of the set of main price tariffs applied by the businesspersons to their clients.

To obtain it, is used the Tourist Accommodation Occupancy Survey: Hotel Establishments (HOS) with the information provided, monthly, by over 10.900 establishments in summer and over 9.200 in winter to whom a questionnaire is sent. From this survey, information is obtained on hotel occupancy (travellers, overnight stays, level of occupancy, etc.), its structure (vacancies, personnel, etc.) and other variables of interest, with a broad geographic breakdown and by category of establishments. In the questionnaire, they are asked, among other variables, the prices applied to different types of clients by double room with bathroom. These prices are broken down into the following tariffs:

- Normal tariff
- Weekend tariff
- Special tour-operators and travel agencies tariff
- Special company tariff
- Special groups tariff

To calculate the 2001 HPI, in month s of year T , the linked Laspeyres index is used, which consists of referring prices from the current period to prices from the immediately previous year. It has the following general form:

$${}_{s,01}IPH^{sT} = \left(\sum_{j,k,t} {}_{s(T-1)}I_{jkt}^{sT} \cdot {}_{s(T-1)}W_{jkt} \right) \cdot \frac{{}_{s,01}IPH^{s(T-1)}}{100}$$

where ${}_{s(T-1)}I_{jkt}^{sT} = \frac{\bar{M}_{jkt}^{sT}}{\bar{M}_{jkt}^{s(T-1)}} \cdot 100$, and the weighting: ${}_{s(T-1)}W_{jkt} = \frac{\bar{M}_{jkt}^{s(T-1)} \cdot B_{jkt}^{s(T-1)}}{\sum_{j,k,t} \bar{M}_{jkt}^{s(T-1)} \cdot B_{jkt}^{s(T-1)}}$,

that represents the percentage of income received by hoteliers per occupied room in a specific province, category and tariff over the income obtained per total tariff; this being,

\bar{M}_{jkt}^{sT} : average price of the establishments of a category k and a province j of a double room with bathroom (excluding VAT and breakfast) in tariff t , in the month s of year T .

$B_{jkt}^{s(T-1)}$: total number of occupied rooms in the establishments of a category k and a province j to which the tariff t is applied in month s of year $T-1$.

$\bar{M}_{jkt}^{s(T-1)}$: average price of the establishments of a category k and a province j of a double room with bathroom (excluding VAT and breakfast) in tariff t , in the month s of year $T-1$.

In the survey, hoteliers are requested to indicate the application percentage of each tariff over the total occupied rooms. From there information is extracted to calculate the occupied rooms in each tariff for every month of the previous year ($T-1$).

The weightings (W) are calculated on a tariff, category of establishment and province level, and subsequently are grouped by tariffs, categories or provinces and Autonomous Communities according to the requested grouped index. Since January 2004 the used weightings have been calculated with data from every month of the year 2003, therefore from January to December the income structure according the province/category/tariff of the establishments is different according to the month. The linked index permits the updating of the weightings, which is carried out annually, not causing a break in the HPI series.

Unlike the Consumer Prices Index (CPI), the HPI is an indicator from the point of view of supply, as it measures the evolution of the prices which hoteliers effectively receive in application of the different tariffs for which they invoice. Therefore, it does not measure the development of the prices paid by households or the official tariff applied by hoteliers, but rather the behaviour of the prices invoiced by hoteliers to different type of clients (households, companies, travel agencies and tour-operators).

Interannual indexes and variation rates for the seventeen Autonomous Communities, Ceuta and Melilla are calculated; moreover, indexes and rates for the different tariffs and categories on a national level are also published.

Methodological improvements. Base 1999 to 2001 changes.

The first time the HPI was published, it was with base 1999. During 2001 the methodology used to calculate the index was analyzed, with the aim of introducing improvements in the indicator. The base used until that moment was also checked with data from 1999. As a result some methodological improvements were included and the index base was updated.

The improvements were introduced in two phases:

1. Since January 2002:
 - a. Weightings are calculated not only on a province and tariff level, but also a category level.
 - b. Simple geometric measurements (without weighting) are used to group establishment prices.
 - c. Occupied rooms instead of overnight stays (occupied vacancies) are taken into account in the weightings.
2. Since January 2003:
 - a. Different weightings are calculated for every month.
 - b. The formula used is a linked Laspeyres index.

These changes had several implications both on the formulation of the index and on its interpretation.

Calculation of the simple indexes

The simple indexes, on an establishment category, tariff and province level, is obtained as the relation between the average price in the months of the current year T and the average price in the same month of the previous year:

$${}_{s(t-1)}I_{jkt}^{sT} = \frac{\overline{M}_{jkt}^{sT}}{\overline{M}_{jkt}^{s(T-1)}} \cdot 100 = \frac{\text{average price in the tariff}_t \text{ category}_k \text{ province}_j \text{ in the month } s \text{ of year } T}{\text{average price in the tariff}_t \text{ category}_k \text{ province}_j \text{ in the month } s \text{ of year } T-1} \cdot 100$$

In turn, the average price of the tariff t in periods (s, T) and $(s, T-1)$ for the stratum jk , \overline{M}_{jkt}^{sT} and $\overline{M}_{jkt}^{s(T-1)}$, are calculated as a simple geometric average of establishment prices.

Calculation of the weightings

Occupied rooms (B) in each tariff in the period $s(T-1)$, which are to be used in the calculation of the weightings, are calculated in the following way:

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

being:

- $B_{ijk}^{s(T-1)}$, number of occupied rooms in the establishment i of category k province j , in period $s(T-1)$.
- $A_{ijkt}^{s(T-1)}$, percentage of occupied rooms in the establishment i of category k province j to which the tariff t was applied, in the period $s(T-1)$.
- $f_{jk}^{s(T-1)}$, elevation factor in stratum jk , calculated as the quotient of the available rooms in the target population for the stratum jk by the available rooms in the sample for the same stratum, in period $s(T-1)$.
- e_{jk} , represents the set of establishments of the sample in stratum jk which have answered the questionnaire.

The weightings applied in month s of year T , is calculated with the information about prices and occupied rooms in the same month, but the previous year:

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

They are, therefore, different for every month, so the stratum (province/category/tariff) has a different relative importance according to the current month. These weightings show the percentage of income received by hoteliers for double rooms with bathroom to which the tariff t was applied in category k , over the total income of every tariffs in all the establishments in the fixed month s .

The weightings ${}_{s(T-1)}L_{jkt}$ are added by tariffs, categories or geographical breakdown required to obtain the weightings of every possible indexes (W).

This method is used since January 2003. In year 2002 there was no monthly distinction, being the weightings the same for every month of the year:

$${}_{01}L_{jkt} = \frac{\widehat{M}_{jkt}^{01} \cdot \widehat{B}_{jkt}^{01}}{\sum_i \sum_j \sum_t \widehat{M}_{jkt}^{01} \cdot \widehat{B}_{jkt}^{01}} \quad \text{with: } \widehat{B}_{jkt}^{01} = \sum_{s=1}^{12} \widehat{B}_{jkt}^{s(01)}$$

Moreover, in the calculation of that year weightings the average price was calculated as an arithmetic average, as well as in the calculation of the simple indexes:

$$\widehat{M}_{jkt}^{01} = \frac{\sum_{s=1}^{12} \widehat{M}_{jkt}^{s(01)}}{12} \quad I_{jkt}^{s(02)} = \frac{\widehat{M}_{jkt}^{s(02)}}{\widehat{M}_{jkt}^{01}} \cdot 100$$

Calculation of linked index

Since January 2003, the group formula used to calculate the HPI is a Laspeyres index linked annually. The reference period of the prices considered is the same month from the previous year, this way twelve series of linked indexes, one for every month, are obtained.

This formula guarantees the continuous update of the structure used in the weighting of the indexes, as the weightings are always calculated with data referred to the immediately previous year. To ensure the comparability of the indexes obtained with different structures, a linked index is used in order to avoid the need to calculate link coefficients for each update carried out. It is owing to the fact that the linked index is equivalent to the index calculated with the new structure linking forward, so it is completely comparable with the indexes previously calculated with different structures.

The disadvantages of this formulation, on the other hand, are:

- . The lack of additivity: it is not possible to obtain the index of any group as a weighted average of the group indexes that comprise it.
- . Lack of the comparison of the index among different months: this comparison is not correct as different weighting structures have been applied each month. This means that the HPI interannual variation rate is the only way to analyse the evolution of hotel prices.

The calculation of the index will be done in the following way (for example, national index by tariff):

$$\text{Year 2002: } {}_{01}IPH_t^{s(02)} = \sum_j \left(\sum_k {}_{01}I_{jkt}^{s(02)} \cdot {}_{s(02)}W_{jkt} \right) \cdot {}_{s(02)}W_{jt}$$

Year 2003:

$${}_{01}IPH_t^{s(03)} = {}_{s(02)}IPH_t^{s(03)} \cdot \frac{{}_{01}IPH_t^{s(02)}}{100} = \left(\sum_j \left(\sum_k {}_{s(02)}I_{jkt}^{s(03)} \cdot {}_{s(02)}W_{jkt} \right) \cdot {}_{s(02)}W_{jt} \right) \cdot \frac{{}_{01}IPH_t^{s(02)}}{100}$$

Year 2004:

$${}_{01}IPH_t^{s(04)} = {}_{s(03)}IPH_t^{s(04)} \cdot \frac{{}_{01}IPH_t^{s(03)}}{100} = {}_{s(03)}IPH_t^{s(04)} \cdot \frac{{}_{s(02)}IPH_t^{s(03)}}{100} \cdot \frac{{}_{01}IPH_t^{s(02)}}{100}$$

In a generic way:

$$\text{Year T: } {}_{01}IPH_t^{sT} = 100 \cdot \prod_{b=2002}^T \frac{{}_{s(b-1)}IPH_t^{sb}}{100}, \text{ with } T=2003, \dots, 2008$$

Base 1999-2001 change. Linked series

Due to the base change which took place in January 2002, changing from base 1999 to base 2001, it was necessary to calculate linking coefficients that could give continuity to the series. These coefficients, calculated for grouped indexes, are applied to the data prior to the introduction of modifications in order to make them comparable with the new base indexes.

Due to the strong seasonal nature of the HPI, monthly linked coefficients were considered the most appropriate. With this method, the interannual variation rates already published were maintained and the overlapping period is increased to the whole year 2001.

Therefore, for 2001, all indexes were calculated again for every month using the new methodology and the new base. Linking coefficients are obtained as quotient of indexes calculated with the new base by those published with the previous base for all grouped indexes already published:

$$K_{01/99}^s = \frac{I_{base\ 2001}^s}{I_{base\ 1999}^s}$$

These multiplicative coefficients are applied to 2001 indexes to calculate the interannual variation rates since January 2002. This way, the break caused by the new HPI system is saved and the comparability of the series is achieved.