

# **Services Sector Price Index. Base 2015**

## **Methodology**

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# 1. Introduction

The Services Sector Price Index (SSPI) is a statistic whose main objective is to measure the evolution in the price of services. To this end, the design used is based on the structures of the different services activities and the products most commercialised in each of them, based on the turnover of the companies involved. These elements, along with others that make up the methodology of this indicator, need to be updated in more or less frequent periods of time in order to preserve the representativeness of the SSPI.

The operation of the base change of the SSPI consists, fundamentally, of reviewing and updating each of its components and determining the best options to achieve a representative and precise indicator that adapts to the trends of the services sector.

Furthermore, Council Regulation (EC) No. 1165/98 concerning short-term statistics establishes a common framework for the production of community statistics for all the countries of the European Union and for a set of short-term indicators for industry, construction and services, in order to analyse the development of the economic cycle. One of the rules included in this regulation states that member states are obliged to change the base of their short-term indicators every five years.

Therefore, the SSPI base 2015, the main characteristics of which are detailed in this methodology, responds on the one hand to the need to adapt to the changes that have taken place in the services sector in recent years and, on the other, meets the requirements established by European regulations in this regard.

Until the entry into effect of the base 2010, the SSPI based its calculation on what is called a fixed-base system, whose main characteristic is that both the composition of the market basket and its weightings are unaltered for the entire time that the base is used. Therefore, the only way to be able to collect the changes in the behaviour of services providers and for the SSPI to adapt to these trends was to wait until the following base change. Obviously, in some cases this time frame was excessively long.

With the SSPI base 2010, a new way of conceiving this indicator was initiated, based on an annual review of the weightings for the main levels of functional aggregation, and the possibility of including any significant change that occurs in the services sector, whether it be the appearance of new products, changes in the productive activity or in the sample of companies. In this way, the SSPI is better adapted to the economic reality and is much more dynamic than its predecessors.

As a result of this operating scheme, in January 2018, the Services Sector Price Index in base 2015 came into effect, replacing the SSPI base 2010, which was in effect until December 2017.

The SSPI base 2015, maintains the main characteristics of the SSPI base 2010, and, like the latter, will annually review the weightings for a certain level of functional disaggregation. To carry out this update, it will use the latest information available from the *Structural Business Statistics: Services Sector*.

In addition, the methodology of the new System was analysed by the High Council on Statistics and by the Permanent Commission of said Council until it was approved in the Plenary of the High Council on Statistics.

The main characteristics of the Services Sector Price Index base 2015 are presented in this methodology.

## 2. Definition of the indicator

The Services Sector Price Indices, which are published on a quarterly basis, aim to measure the evolution of the prices of services provided by companies operating in the services sector in Spain, from the supply side (producer's point of view). The prices considered for the calculation are those of the services provided to companies (**business segment**).

The precision with which this short-term indicator measures the evolution of price level depends on two qualities that every index must have: **representativeness and comparability over time**.

The degree of **representativeness** of the SSPI is determined by the adaptation of this indicator to the current economic reality; thus, the variation rate calculated from the SSPI will more closely approximate the evolution of the set of prices of the sector, the more the elements selected for its measurement are adapted to the behaviour patterns of the providers. To achieve this, the selected products that comprise the market basket of the SSPI should be those most sold within the corresponding branch, the companies in the sample must have the highest turnover in the sector, and the relative importance of each product in the market basket must respond to the sales trends of the services sector. The better the selection of these elements, the more representative the indicator will be.

Furthermore, the SSPI is an indicator that only makes sense when comparisons are made over time; in fact, an index number barely has any meaning if a comparison is not established with indices from other periods, to obtain the corresponding variation rates (this could be one month, one quarter, one year, or any other period of time). Therefore, the other quality that can be attributed to a SSPI is the **comparability over time**, that is, the need for the elements that define the SSPI to remain stable over time, except, logically, the prices collected every quarter. In this way, any variation in the SSPI will be due only to changes in the prices of the selected products and not to any change in the methodological content of this indicator.

The applications of the SSPI are numerous and of great importance in the economic and legal fields. Among them it is worth noting its use as a measure of price inflation in the production of services consumed mainly by companies. It is also applied as a deflator in the National Accounts and in the Services Sector Activity Indicator (SSAI).

## 3. Indicator scope

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### 3.1 Time scope

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#### 3.1.1 BASE PERIOD

The base period or reference period of the index is the one in which the index equals 100. This is normally an annual period. In the new system, the arithmetic mean of the four quarterly indices of the year 2015 published in base 2010 is equal to 100. This means that the year 2015 is the period to which the successive indices that will be published in the new base refer, and that is why it is called SSPI base 2015.

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#### 3.1.2 REFERENCE PERIOD OF THE PRICES

This is the period with whose prices the current prices are compared, that is to say, the period chosen for the calculation of the elementary indices.

With the calculation formula used for the SSPI base 2015 (chained Laspeyres), the price reference period is the last quarter of the year immediately preceding the year under consideration. Therefore, at the beginning of each year the reference period changes.

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#### 3.1.3 REFERENCE PERIOD OF THE WEIGHTINGS

The reference period of the weightings is the period to which the weightings that serve as the structure of the system refer.

For the year 2018, the calculation of the weightings has been carried out based on the data from the *Structural Business Statistics (SBS): Services Sector*, the *Statistics on Products in the Services Sector*, and the SSPI itself, referring to the year 2015, which provide information on turnover by branch of activity and, for some activities, by product.

In addition, in order to correct the mismatch between this reference period of the annual surveys and the price reference period (fourth quarter of 2017), the weightings have been updated using information on price developments from the SSPI.

Thus, the reference period for the weightings will be the last quarter of 2017, during 2018, and the last quarter of the immediately preceding year in subsequent years, as the weightings will be updated annually, using the latest available information from the *Structural Business Statistics* and the SSPI.

This annual revision of weightings will be performed for certain functional breakdown levels, using the information available closest to the moment of the revision.

In addition, every five years, a base change will be carried out, in which the weightings will be updated for all functional breakdown levels.

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### 3.2 Population scope

The population of the index or reference stratum is the population group whose income structure serves as the basis for the selection of representative products and the calculation of their weights.

In the SSPI base 2015, the reference stratum of the index includes all companies that provide services to other companies, both in the domestic and foreign markets.

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### 3.3 Geographical scope

The geographical scope of the research is comprised of the entire national territory.

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### 3.4 Scope of application

This is the set of services that companies in the reference strata provide to other companies, both in the domestic and foreign markets.

Each branch of activity of the CNAE is represented by one or more products in the SSPI, so that the evolution in the prices of these products represents that of all the elements comprising that branch of activity. This is called a *market basket of products*.

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#### 3.4.1 MARKET BASKET OF PRODUCTS

It is the set of products selected in the SSPI whose price evolution represents that of all those that comprise the branch of the CNAE to which they belong.

The selection of the products that make up the SSPI market basket has been made on the basis of the SSPI base 2010, and data from the *SBS Services Sector 2015* and the *Statistics on Products in the Services Sector 2015*. The criterion for determining which services should be considered as part of the indicator is to include all services that exceed a minimum threshold for the turnover of the branch. In addition, meetings are held with the representative agents of each sector and the recommendations of international reports are followed in order to achieve an adequate selection of products.

Thus, the total number of products comprising the market basket of the SSPI base 2015 is 111.

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### 3.5 Functional breakdown of the indices

The SSPI base 2015 is completely adapted to the international classification of economic activities CNAE-2009.

The functional structure of the new SSPI compared to that of the SSPI base 2010 is the same at all levels, and covers the following activities, as set out in the European regulation:

49.4 Freight transport by road

50.1+50.2 Sea transport

51 Air transport

52.1 Cargo handling

- 52.24 Warehousing and storage
- 53.1 Postal activities under universal service obligation
- 53.2 Other postal and courier activities
- 61 Telecommunications
- 62 Computer programming, consultancy and related activities
- 63 Information Services
- 69.1+69.2+70.2 Legal activities; accounting, bookkeeping, auditing and tax consultancy; business management consultancy activities
- 71 Architectural and engineering activities; technical testing and analysis
- 73 Advertising and market research
- 78 Employment activities
- 80 Security and investigation activities
- 81.2 Cleaning activities

Most of the activities are published at the level of division (2 digits of CNAE-09) or group (3 digits of CNAE-09).

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### **3.6 Geographical breakdown of the indices**

Both the SSPI base 2015 and its predecessors do not calculate indices geographically disaggregated at the level of Autonomous Community or province, only indices for the national total are calculated.

## 4. Sample design

As in most countries of the European Union (EU), the sample design of the prices involved in the calculation of the SSPI is based on a cut-off sampling, consisting of ordering the items to be sampled in a decreasing order according to their values (in this case, turnover) and selecting for the sample those that exceed a minimum threshold established. It is, therefore, a non-probabilistic design, given the characteristics of the population under study.

In order to obtain significant indicators at the publication levels, the sample selection process has been structured into three main sections, each of which aims to select the different components of the sample. These are as follows:

- Selection of activities.
- Selection of products.
- Selection of companies.

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### 4.1 Selection of activities

As mentioned above, the activities that are part of the calculation of the SSPI base 2015 are those included in the Commission Regulation (EC) No. 472/2008 (update for CNAE 2009 of Regulation (EC) No. 1158/2005).

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### 4.2 Selection of products

The heterogeneity of services and their intrinsic characteristics (intangibility, inseparability and perishability) make it necessary to use different methods for the selection of representative services for each branch. .

In principle, the products that make up the SSPI market basket base 2015 are included according to their turnover within the class to which they belong, until they cover 70% of it.

The information to select the products is obtained from the *Statistics on products in the Services Sector*, referring to the year 2015, for those activities included in it. For the rest of activities, a detailed study of the sector is carried out, meetings are held with representative agents of the sector and the recommendations of international research and reports are followed for an adequate selection of products.

With these selection criteria in the SSPI base 2015, the market basket is made up of 111 products.

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### 4.3 Selection of companies

For each of the products in the market basket, the establishments are selected in such a way as to guarantee that the estimation of the variation rates is significant at the maximum level of functional breakdown that is published.

In general, the number of companies surveyed for each product within each activity is determined according to their weight, trying to cover between 60% and 70% of the turnover of this activity.

In *legal and economic consultancy activities* (groups 69.1, 69.2 and 70.2 of the CNAE 2009) and *Architectural and engineering activities* (group 71.1 of the CNAE), the population of companies is stratified according to their turnover, being the largest stratum comprehensive and with annual rotation of part of the sample in the smallest strata.

The information for the selection of companies is obtained from the *Structural Business Statistics: Services Sector* and the *Statistics on Products in the Services Sector*, referring to the year 2015.

Thus, in the SSPI base 2015 prices are collected in a sample of nearly 850 companies.

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#### **4.4 Number of observations**

The number of observations for each product is determined by the sub-variety reported by the companies.

Each company is required to report information on the price of the sub-varieties (specific models of a service) they sell the most.

Thus, in the base 2015 there are approximately 7,000 prices of sub-varieties.

## 5. General calculation method

The formula used to calculate the SSPI indices base 2015 is the chained Laspeyres formula, which has already been used for the SSPI base 2010.

The general index corresponding to a moment in time  $t$  is mathematically expressed as follows:

$${}_0 I_{LE}^t = \prod_{k=1}^t \frac{\sum_i p_i^k q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}}$$

Where:

$p_i^k$  and  $p_i^{k-1}$  is the price of product  $i$  at the time  $k$  and  $k-1$ , respectively

$q_i^k$  is the quantity of the product  $i$  produced at the time  $k-1$ .

Similarly, it can be expressed as:

$${}_0 I_{LE}^t = \prod_{k=1}^t \frac{\sum_i \frac{p_i^k}{p_i^{k-1}} p_i^{k-1} q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}} = \prod_{k=1}^t \sum_i I_i^k W_i^{k-1}$$

where:

$$I_i^k = \frac{p_i^k}{p_i^{k-1}} \quad \text{and} \quad W_i^{k-1} = \frac{p_i^{k-1} q_i^{k-1}}{\sum_i p_i^{k-1} q_i^{k-1}}$$

As can be seen, a chained index establishes the relationship between the current period ( $t$ ) and the base period ( $0$ ) on the basis of intermediate situations ( $k$ ).

In the SSPI base 2015, the intermediate situations considered correspond to the last quarter of each year. Thus, the index in base 2015 for the quarter  $m$  of the year  $t$ , is obtained as the product of indices in the following way:

$$\begin{aligned} {}_{15} I_G^{mt} &= {}_{15} I_G^{4T(t-1)} * \left( \frac{{}_{4T(t-1)} I_G^{mt}}{100} \right) = \\ &= {}_{15} I_G^{4T15} * \left( \frac{{}_{4T15} I_G^{4T16}}{100} \right) * \dots * \left( \frac{{}_{4T(t-2)} I_G^{4T(t-1)}}{100} \right) * \left( \frac{{}_{4T(t-1)} I_G^{mt}}{100} \right) \end{aligned}$$

where:

${}_{15}I_G^{mt}$  is the general index, in base 2015, for the quarter  $m$  of the year  $t$ .  
 ${}_{4T(t-1)}I_G^{mt}$  is the general index, referring to the last quarter of the year  $(t-1)$ , of the quarter  $m$  of the year  $t$ .

The main inconvenience of chained indices is the lack of additivity. For this reason, it is not possible to obtain the index of any aggregate in base 2015 as a weighted average of the indices in base 2015 of the aggregates that compose it.

## 5.1 Elementary indices

An elementary aggregate is the component with the lowest level of aggregation for which indices are obtained, and in whose calculation no weightings are involved; the price indices of these aggregates are called elementary indices. In the SSPI, an elementary index is calculated for each product in the market basket within defined strata for each activity. In this case, the elementary aggregate is the stratum-product.

The index of the elementary aggregate  $i$  is obtained as the quotient of the average price of that elementary aggregate in the current period and the average price in the reference period of the prices, that is, the fourth quarter of the previous year:

$${}_{4T(t-1)}I_i^{mt} = \frac{\bar{P}_i^{mt}}{\bar{P}_i^{4T(t-1)}} \times 100$$

where:

${}_{4T(t-1)}I_i^{mt}$  is the index, referring to the fourth quarter of the year  $(t-1)$ , of the elementary aggregate  $i$ , in the quarter  $m$  of the year  $t$ .

$\bar{P}_i^{mt}$  is the average price of the elementary aggregate  $i$ , in the quarter  $m$  of the year  $t$ .

$\bar{P}_i^{4T(t-1)}$  is the average price of the elementary aggregate  $i$ , in the fourth quarter of the year  $(t-1)$ .

At the same time, the average price of the aggregate  $i$ , in the period  $(m,t)$ ,  $\bar{P}_i^{mt}$ , is the simple geometric mean of the prices collected in that period:

$$\bar{P}_i^{mt} = n_i^{mt} \sqrt[n_i^{mt}]{\prod_{j=1}^{n_i^{mt}} P_{i,j}^{mt}}$$

where:

$P_{i,j}^{mt}$  is the price of the elementary aggregate  $i$  collected in the company  $j$ , in the period  $(m,t)$ .

$n_i^{mt}$  is the number of prices processed for the elementary aggregate  $i$ , in the period  $(m,t)$ .

The geometric mean gives the same importance to the variations of all prices, regardless of their level.

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## 5.2 Weightings

The weighting structure of the SSPI base 2015 has three fundamental sources of information:

- The *Structural Business Statistics (SBS): Services Sector*, which provides data on the turnover of services companies, by branch of activity.
- The *Statistics on Products in the Services Sector*, which provides information on turnover by product for certain activities.
- The SSPI survey itself, which provides information on the distribution of the turnover of the company among the services it provides.

From the first, the weighting of each of the branches represented in the SSPI is obtained, as a quotient of the turnover of the companies whose main activity is this branch and the total turnover of the upper aggregate branch. Before calculating the weights, the turnover of the branches not represented is distributed among the branches of the upper aggregate.

Subsequently, to obtain the product weights, based on the information on the distribution of turnover among the services provided, obtained from the *Statistics on Products in the Services Sector*, or requested from each company in the SSPI questionnaire, the weighting of the branch is distributed among the services that make up the SSPI market basket.

Finally, within each product two strata are established: the first one is formed by the companies with the highest turnover, until reaching at least 70% of the total turnover of the product in the companies that are part of the sample, and the second one with the rest of the selected companies. The weighting of each product is divided into these two strata according to the weight of each of them.

The data used in the calculation of the weightings, used during the year 2018, are those corresponding to the year 2015.

In addition, in order to correct the mismatch between the weighting reference period and the price reference period (fourth quarter of 2017), the weightings are updated using

information on price developments from the SSPI. In this way, the reference period of the weightings used during the year 2018 is the fourth quarter of 2017.

As mentioned above, the weight or importance of the aggregates that make up this indicator is updated annually, which allows the indicator to be adapted to changes occurring in the activities of the services sector.

The weighting of each branch represents the ratio between the turnover of that branch and the total turnover:

$$W_i = \frac{\text{cifra de negocios de la rama } i}{\text{cifra de negocios agregado superior}}$$

The weight of each class is distributed among the products included in that activity according to the relation between the turnover of that product and the turnover of all the products included in the branch to which they belong:

$$W_{ij} = W_i * \frac{\text{cifra de negocios del producto } j}{\text{cifra de negocios en la rama } i}$$

Thus, the weighting of the functional aggregate  $A$  is obtained as the sum of the weightings of the products that make up said aggregate:

$$W_A = \sum_{i \in A} W_i$$

The annual updates of the weightings, to be conducted in the SSPI base 2015 will be carried out with the latest available annual information from the *Structural Business Statistics: Services Sector*.

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### 5.3 Aggregate indices

As already mentioned above, the elementary indices refer to the fourth quarter of the immediately preceding year. In turn, the weightings used for the calculation of the aggregations also refer to the last quarter of the previous year, thereby maintaining coherence with the reference prices.

Aggregate indices are calculated using weighted sums of the elementary indices. Thus, different functional aggregations can be obtained, as detailed below.

#### Functional aggregations for the national total

In order to calculate the index referenced to the fourth quarter of the year prior to the current year of any functional aggregation  $A$  (products, divisions, etc.), for the national total, the elementary indices of the products belonging to said aggregation shall be aggregated using their weightings in the SSPI market basket in the following manner:

$${}_{4T(t-1)}I_A^{mt} = \frac{\sum_{p \in A} {}_{4T(t-1)}I_{Ap}^{mt} * {}_{4T(t-1)}W_{Ap}}{\sum_{p \in A} {}_{4T(t-1)}W_{Ap}}$$

where:

${}_{4T(t-1)}W_{Ap}$  is the weighting of the functional aggregation  $A$  in the stratum  $p$ , referring to the *fourth quarter of (t-1)*, which comes into effect in the first quarter of the year  $t$ .

${}_{4T(t-1)}I_{Ap}^{mt}$  is the index, referenced to the fourth quarter of  $(t-1)$ , of the functional aggregation  $A$  in the stratum  $p$ , in the quarter  $m$  of the year  $t$ .

Once the aggregate indices are calculated as detailed above, it is necessary to chain them. These indices are those which are finally disseminated and give continuity to the series published.

For any functional aggregation  $A$ , the index in base 2015 is calculated as follows:

$$\begin{aligned} {}_{15}I_A^{mt} &= {}_{15}I_A^{4T(t-1)} * \left( \frac{{}_{4T(t-1)}I_A^{mt}}{100} \right) = \frac{{}_{15}I_A^{4T(t-1)}}{100} * {}_{4T(t-1)}I_A^{mt} \\ &= C_A^t * {}_{4T(t-1)}I_A^{mt} \end{aligned}$$

That is, each index calculated with reference to the fourth quarter of  $t-1$  is multiplied by a coefficient, obtained as a quotient between the index in base 2015 of the fourth quarter of  $t-1$  and 100. This coefficient is called the **chaining coefficient**.

## 5.4 Calculation of variation rates

### 5.4.1 QUARTERLY VARIATION RATES

The quarterly variation rate of an index in the period  $(m, t)$  is calculated as the quotient between the index of the current quarter  $m$  and the index of the previous quarter  $(m-1)$ , according to the following formula:

$$V^{mt/(m-1)t} = \left( \frac{{}_{15}I^{mt}}{{}_{15}I^{(m-1)t}} - 1 \right) * 100 = \left( \frac{{}_{4T(t-1)}I^{mt} * C^t}{{}_{4T(t-1)}I^{(m-1)t} * C^t} - 1 \right) * 100 =$$

$$= \left( \frac{{}_{4T(t-1)}I^{mt}}{{}_{4T(t-1)}I^{(m-1)t}} - 1 \right) * 100$$

where:

- $V^{mt/(m-1)t}$  is the quarterly variation rate, in the quarter  $m$  of the year  $t$ .
- ${}_{15}I^{mt}$  is the index, in base 2015, in the quarter  $m$  of the year  $t$ .
- ${}_{4T(t-1)}I^{mt}$  is the index, referring to the fourth quarter of the previous year, in the quarter  $m$  of the year  $t$
- $C^t$  is the chaining coefficient in year  $t$ .

In other words, the quarterly variation rates can be calculated with the published indices, in base 2015, or with the unchained indices (referring to the fourth quarter of the previous year).

#### 5.4.2 ACCUMULATED VARIATION RATES

The accumulated (or year-to-date) variation rate is calculated as the quotient between the index for the current quarter and the index of the fourth quarter of the previous year:

$$V^{mt/4T(t-1)} = \left( \frac{{}_{15}I^{mt}}{{}_{15}I^{4T(t-1)}} - 1 \right) * 100 = \left( \frac{{}_{4T(t-1)}I^{mt} * C^t}{{}_{4T(t-1)}I^{4T(t-1)} * C^t} - 1 \right) * 100 =$$

$$= \left( \frac{{}_{4T(t-1)}I^{mt}}{{}_{4T(t-1)}I^{4T(t-1)}} - 1 \right) * 100 = \left( \frac{{}_{4T(t-1)}I^{mt}}{100} - 1 \right) * 100$$

where:

- $V^{mt/4T(t-1)}$  is the accumulated variation rate, in the quarter  $m$  of the year  $t$ .
- ${}_{15}I^{mt}$  is the index, in base 2015, in the quarter  $m$  of the year  $t$ .
- ${}_{4T(t-1)}I^{mt}$  is the index, referring to the fourth quarter of the previous year, in the quarter  $m$  of the year  $t$ .
- $C^t$  is the chaining coefficient in year  $t$ .

That is to say, the accumulated variation rates can be calculated with the published indices, in base 2015, or with the unchained indices (referring to the fourth quarter of the previous year). In the latter case, the index of the fourth quarter of  $t-1$  referring to the fourth quarter of  $t-1$  is equal to 100, by definition.

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#### 5.4.3 ANNUAL VARIATION RATES

The annual variation rate is calculated as the quotient between the indices published for the current quarter, and for the same quarter the previous year, both in base 2015:

$$V_{m(t-1)}^{mt} = \left( \frac{{}_{15}I^{mt}}{{}_{15}I^{m(t-1)}} - 1 \right) * 100$$

where:

$V_{m(t-1)}^{mt/m(t-1)}$  is the annual variation rate, in the quarter  $m$  of the year  $t$   
 ${}_{15}I^{mt}$  is the index, in base 2015, in the quarter  $m$  of the year  $t$ .

In the case of annual variations, these cannot be calculated with the indices referring to the fourth quarter of the previous year, as occurs with the quarterly and accumulated variations. The reason is that each of the two indices involved in the formula has been chained with different chaining coefficients (one referring to the year  $t$  and the other to  $t-1$ ) so they are not reduced, as in the previous formulas:

$$V_{m(t-1)}^{mt} = \left( \frac{{}_{15}I^{mt}}{{}_{15}I^{m(t-1)}} - 1 \right) * 100 = \left( \frac{{}_{4T(t-1)}I^{mt} * C^t}{{}_{4T(t-2)}I^{m(t-1)} * C^{t-1}} - 1 \right) * 100$$

## 6. Collection of prices

The collection of prices for the products included in the SSPI market basket is carried out from the central services of the INE, through the completion of a quarterly questionnaire by the company.

Since 2011, the INE has promoted the completion of questionnaires via the Internet, through the IRIA collection platform (Integration of Information Collection and Administration). The request for information is made by means of a personalised questionnaire for each company in the sample and the respondents fill it in mainly via the web or by e-mail, or by using the traditional telephone, fax or postal mail channels.

The prices collected should meet the following conditions:

- Any discounts, rebates, surcharges, etc., that may be applied to customers must be taken into account.
- As the price reflects the income earned by the producer, taxes on services should be excluded from the price and any subsidies received by the producer should be added.
- It is necessary to take into account actual sales that lead to effective prices. Therefore, transactions within the same company which only give rise to accounting prices are not included.
- Services sold to the domestic and foreign markets are included.
- The price must refer to the date of service delivery.

In the case of services prices, because of the intrinsic characteristics of services, the choice of the most widely sold sub-variety (type of service) becomes more complicated, since in many cases services are provided only once or it is difficult to identify a single service because several services are provided in one package.

Even with these difficulties, those types (sub-variety) that meet the following conditions must be selected within each service:

- they are the most frequently offered services (representative),
- they must maintain the same characteristics (technical and marketing criteria determining the price: quality, quantity, type of customer, etc.) over time (homogeneous),
- their price evolution is similar to the other services they represent within the product,
- they have permanence in the market,
- they are easy to observe.

In those cases in which it is not possible to observe the price of the specific service, one of the following alternatives may be used, depending on the type of service considered:

- Contract prices: Service providers choose one or more specific service contracts that are repeated over time.
- Prices of services repeated over time: Prices are collected from real transactions or price lists.
- Unit values: When the services are homogeneous, the value of the total turnover of the service can be divided by the amount of the service performed.
- Component prices: The service is divided into a series of key components and the price of each of them is collected separately.

- Prices based on percentages: The price is estimated by multiplying the percentage charged by the value of the service to which the percentage is associated.

It may also happen that even though the service is clearly specified, the price cannot be directly observed, in which case the method used is the following:

- Model prices: The price of a fictitious service or model agreed between the INE and the company is recorded.

Finally, when the service cannot be clearly specified, the price is approximated by the costs necessary for its provision:

- Prices based on hourly costs: The price of a standard amount of work (e.g. one hour) for the different work categories of the company is collected.

There are two exceptions to the above: The data used to calculate the *Advertising Price Index* (73.1 CNAE-2009) are provided by the company INFOADEX, which carries out the monitoring and analysis of advertising in Spain. And the *Road Freight Transport Price Index*, which is prepared by the Ministry of Public Works.

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## 6.1 Organisation of fieldwork

The information is collected by the personnel assigned to the survey in the INE Central Services.

The technical responsibility corresponds to the survey inspector. He or she is responsible for organising and distributing the work, analysing the price series, planning the sending of questionnaires and data collection and, in general, solving problems that arise during the collection of prices.

The interviewers are responsible for sending and receiving the price questionnaires, monitoring the products to confirm that they are always the same and, if they are not, verifying that the sub-varieties proposed as substitutes are correct, as well as claiming this substitution if the company does not propose substitutes. He or she will also inform the survey inspector of any incidents that may arise.

# 7. Processing of information

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## 7.1 Information reception

As mentioned above, the collection is carried out by means of a questionnaire in which the respondent of the company records the prices of the products requested and their corresponding incidences, if any. Once completed, the questionnaire is sent to the INE central services.

After an initial cleaning of the questionnaires received by the interviewer, the data are recorded.

After each recording stage of questionnaires, computer applications are used to detect possible errors.

The interviewers are also responsible for checking the atypical prices before moving on to the next stage of the process. This system allows to detect any error in the collection of data and resolve the incident without much time from the time of collection of the information.

The last stage is the analysis of the price series by the survey inspector.

The total number of prices processed monthly, which is approximately 7,000, is analysed requiring, when necessary, confirmation by the delegations on atypical variations. Once the prices have been cleaned and analysed, the indices and their corresponding rates of variation are obtained and published on a provisional basis at the end of the quarter following the reference quarter of the data. The data will become final one year after its first publication.

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## 7.2 Cleaning of prices

As mentioned in the previous section, all prices collected quarterly are received, cleaned and analysed by the INE Central Services.

In general, all variations of more than 10% or less than -10% are reviewed for all products and those within the range (-10%, 10%) that have a significant impact on the index.

In addition to that, the processing of the lack of price is also carried out, that is, the price of those products that were not available at the time of completing the questionnaire is estimated.

The method for estimating the lack of prices consists of applying the average variation of the rest of the prices collected for the same product in the other companies of the sample, within the activity to which it belongs.

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## 7.3 Quality changes

The accuracy with which the SSPi estimates price changes depends, to a large extent, on the stability over time of the conditions initially established. This implies that the product selected for the sample should not change its technical and commercial characteristics.

However, this requirement for uniformity is not always possible, especially in the services sector, because of the heterogeneous nature of services and because the market itself is characterised by the differentiation of products and the segmentation of the market. These problems are most pronounced in certain sectors. In such cases, adjustments are needed to correct changes in the sample of products and to estimate the price variation without being disturbed by the change. These adjustments are known as adjustments due to a change in quality.

This problem can be solved, to some extent, by an appropriate selection of sub-varieties and sometimes by using certain methods of price collection, such as contracts, models or unit values, even if these do not correspond to real transactions. As a general rule, when a price variation occurs as a result of a change in specifications in a sub-variety, it is assumed that the variation is not due solely to a price variation, and if no additional information is available to calculate what part of the variation is due to the price variation and what part to the quality change, the price variation is estimated with the average variation of the rest of the prices of that product.

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#### 7.3.1 DEFINITION

As already indicated, an adjustment for quality change is necessary when one sub-variety, the price of which is part of the SSPI calculation, is substituted for another. When this happens, it is necessary to determine what part of the price difference between the new sub-variety chosen and the one that disappears is due to the fact that the quality is different between both.

Substitutions of sub-varieties may be due to several reasons:

- the company ceases to provide the service corresponding to the sub-variety collected;
- the sub-variety is no longer representative in the company;
- the company where the price of the sub-variety is collected is no longer representative, closes or changes its economic activity.

The sub-varieties that comprise the market basket remain fixed over time as they define the most representative type of services marketed, but must be replaced when they are no longer marketed or are no longer the most sold in the company.

When the sub-variety that disappears and the new one coexist in time, it is possible to establish a relationship between both, and the quality adjustment is almost automatic. However, there is not always an overlap period between the products, nor is there an identity between a service and the one that replaces it. It is therefore necessary to estimate which part of this price difference is due to changes in conditions in the service provided and what part is pure price variation.

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#### 7.3.2 QUALITY ADJUSTMENT METHODS

The quality adjustment methods that are the most habitually used in the SSPI base 2015, are the following:

a) Total quality adjustment.

It starts from the assumption that the difference between the price of the substituted product and the substitute product is entirely due to the difference in quality between the two or that the products are so different that they cannot be compared. It is therefore considered that the difference in prices between the two products is due only to the different quality of the products, so that the index will not reflect price variations. With this adjustment it is assumed that if the substituted product had remained for sale, its price would not have changed.

b) Adjustment due to identical quality.

It is assumed that the substitute product is of the same quality as the substituted product, i.e. that the price difference between the two is due to a real price change. With this adjustment, it is assumed that had the substituted product been sold, its price would have been the same as that of the substitute product.

c) Other adjustments.

This section includes all those adjustments for which the value of the difference in quality between one service and its substitute is estimated. The most frequent practices are:

- Imputation prices.

It is imputed the variation of the average price of a larger aggregate to which the product belongs.

- Information provided by experts:

Experts or specialists on the product are asked which amount of the difference between the prices of the products (substitute and substituted) is due to the difference in quality between both.

- Overlap prices:

The value of the quality difference between the substituted and the substitute product is the price difference between them in the overlap period, i.e. in the period in which both products are for sale.

In most cases, the method used to make the quality adjustments in the SSPI is that of imputation prices.

## 8. Chained series

For the new SSPI base 2015, as it is a chained index, it has not been necessary to calculate any chain coefficient, since the chaining calculation method allows changes to be made in weightings, sample and methodology every fourth quarter and to chain the indices obtained with the new calculations, with the series that had been published calculated with the old sample, weightings and methodology.

Thus, in the SSPI base 2015, only the reference period of the indices or base period has been changed, which went from being the year 2010 to the year 2015. For this purpose, a **re-scale coefficient** has been calculated, which has converted the indices published in base 2010, from the first quarter of 2007 to the fourth quarter of 2017, into indices in base 2015.

This coefficient is the one which makes that the simple arithmetic mean of published indices in 2016, in base 2011, is equal to 100:

$$\left( \frac{1}{4} * \sum_{m=1T}^{4T} {}_{10}I^{m15} \right) * C_{re-escala} = 100 \rightarrow$$
$$\rightarrow C_{re-escala} = \frac{100}{\left( \frac{1}{4} * \sum_{m=1T}^{4T} {}_{10}I^{m15} \right)}$$

By multiplying the series published in base 2010 by this re-scale coefficient, we obtain a series of indices in base 2015, which preserves the variation rates published, and with which the new indices in base 2015 have been chained, calculated as of the first quarter of 2018.

In this way, the INE has given continuity to all the series that have been published until now.

# Annex I. Calculation of aggregated indices

With the calculation formula of the SSPI base 2015 (chained Laspeyres), the indices referring to *the fourth quarter of the year (t-1)* start from a value equal to 100 in the last quarter of that year. Since it is necessary to give continuity to the published SSPI series, the indices must be chained to obtain indices that give continuity to those already published in previous periods.

Thus, the chained index (the one to be published) in the quarter *m* of the year *t*, in base 2015, is obtained by multiplying the index of the *fourth quarter of (t-1)*, in base 2015, by the index of the quarter *m* of the year *t* referred to *the fourth quarter of (t-1)*, divided by 100:

$${}_{15}I^{mt} = {}_{15}I^{4T(t-1)} * \left( \frac{{}_{4T(t-1)}I^{mt}}{100} \right)$$

Chained indices are not additives, that is, from published indices it is not possible to calculate the indices of functional aggregations. These aggregations are calculated using the indices referring to the fourth quarter of the previous year (the unchained ones), which are additives.

The following describes the steps to follow to obtain the index in base 2015 of an aggregate *A*, from the indices published, in base 2015, of its components *A1* and *A2*:

1. The indices referring to the fourth quarter of the previous year must be obtained for each component *A1* and *A2*. This is done by dividing the published index of the quarter *m* of the year *t*, by the published index of the fourth quarter of the previous year:

$${}_{4T(t-1)}I_i^{mt} = \left( \frac{{}_{15}I_i^{mt}}{{}_{15}I_i^{4T(t-1)}} \right) * 100 \quad i = A1 \text{ y } A2$$

2. The indices obtained in the previous step are aggregated using the weights in force in the reference period of the index (*m,t*). With this, the index of the aggregate *A*, is obtained, referred to the fourth quarter of (*t-1*):

$${}_{4T(t-1)}I_A^{mt} = \frac{{}_{4T(t-1)}I_1^{mt} \times {}_{4T(t-1)}W_1 + {}_{4T(t-1)}I_2^{mt} \times {}_{4T(t-1)}W_2}{{}_{4T(t-1)}W_1 + {}_{4T(t-1)}W_2}$$

3. The index in base 2015 of aggregate *A* is calculated as the product of the index published in the fourth quarter of the previous year, by the quotient between the aggregate index obtained in step 2 and 100:

$${}_{15}I_A^{mt} = {}_{15}I_A^{4T(t-1)} * \left( \frac{{}_{4T(t-1)}I_A^{mt}}{100} \right)$$

