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Improving the quality of Price Indices: CPI & PPP

A data quality control approach in price surveys for PPPs estimates

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Abstract

A data quality control approach in price surveys for PPPs estimates

Price data collected in different places may be subjected to a particular "price level index" analysis in the spatial sense. Such indexes are computed for each product according to both the exchange rate and basic heading parity. At the basic heading level, however, only the price level index relative to the exchange rate is computed. The price level index analysis is developed in three directions:

- a) variability observation, separately, of price quotations, country level indices (for each product) and product level indices (for each country and each basic heading);
- b) search for extreme product level index values;
- c) study of the relation between price level indexes computed separately in two ways: respect to the exchange rate, on the one hand and basic heading parity, on the other.

From this analysis indications for each place (e.g.: country) arise which are very useful for further checking of the price data, before proceeding to price approval.

Introduction

The quality of data depends on correct choice of procedures and control of the entire range of factors which may generate a "statistical error" component with regard to microdata and/or macrodata in such a manner as to render such data unsuitable for the aim to be reached.

In this case, the aim is estimation of a spatial deflator or purchasing power parity (PPP) for comparison of economic aggregates in terms of volume.

The "errors" in question may relate to samples, such as those associated with sample estimations, or they may be of a different nature, such as those associated with survey techniques, methodological procedures adopted, degree of spatial comparability of prices due to quantitative and qualitative characteristics of products surveyed, or such as those ascribed to other causes.

Of course, those taking part in spatial comparisons are engaged in an ongoing activity both of qualitative improvement and of perfecting resources and procedures as much as possible with regard to the various aspects of the entire PPP estimation operation.

For reasons of space, this question cannot be gone into fully.

This paper will only contain considerations regarding questions of control of spatial comparability of surveyed prices. If such control is not carried out, non-aleatory errors in estimation of price comparisons may be generated. On a basic heading level, such errors may even be considerable.

The principles governing choice and definition of products

The first aggregation level of PPPs estimation is that of parities with respect to all basic headings. Such headings consist in a homogeneous group of products which, in practical terms, is made up of a small sample of products. From the qualitative point of view, this sample must comply with three important principles:

- a) representativeness vis-à-vis a group of products coming under the basic heading;
- b) equi-characteristicity with regard to the consumption of the countries taking part, so as to avoid the bias in results known as the "Gerschenkron effect";
- c) a precise and complete definition of each product, in order to prevent biases due to differences of quality.

The method of quality control of surveyed prices presented here concerns control of the correct application of the third mentioned principle and, also, of the second principle. It would therefore be appropriate to go into principles b) and c) at greater length.

The principle of "equi-characteristicity" would appear to be essential as far as spatial comparisons of prices (and volumes) are concerned.

Indeed, if we bear in mind the negative correlation which generally exists between relative prices and relative quantities, if the list of products is characteristic of a given place and not of other places, underestimation of the prices of that place compared with other places would come about and, therefore, corresponding overestimation of relative volumes. This type of bias is known as the "Gerschenkron effect"

During intra-European comparisons, for example, the principle of "equi-characteristicity" is already applied during PPP estimation of the basic heading level. Such application is obtained by including the sample products which are characteristic of all countries taking part and calculating parity by means of a specific method which, while complying with a principle of gradualism carries out comparison of the more homogeneous situations directly, and of the heterogeneous situations indirectly (through more homogeneous intermediate situations). To a certain extent, the method proposed here controls the anti-bias effect in results following application of the above principle.

The principle of precise and complete definition of each product consists of full, clear description of such products and specification of all their qualitative characteristics. Wherever possible, specific makes and models found in most of the country are pinpointed. To simplify matters, products of the same brand name and model are known as "identical products" and those which may accorded a single definition are known as "comparable products".

Of course, the main danger in making comparisons of qualitatively differing products in different places should only arise with regard to "comparable products" and not for "identical product". However, this is not always the case. A given product may be exported with a different trade or brand name and/or its characteristics and options which vary according to market.

Quality control of price data for spatial comparison

The proposed method consists of drawing up a "table" with price data, price level and certain parameters regarding variability of prices. This table should facilitate quick consultation for a general appreciation of consistency with respect to the basic heading. It should also provide a fairly in-depth analysis of surveyed prices and should also permit pinpointing those cases which are to be controlled further.

Indeed, the main aim of such quality control is highlighting those prices which generate values of indices of price levels which fall outside given ranges. This may happen with prices calculated according to exchange rate or according to parity of basic heading (this latter consideration gives rise to greater concern). The basic hypothesis posits a degree of homogeneity of products which represent any basic heading - even, or rather, above all - with regard to the structure of relative prices on a spatial level.

Initial analysis with regard to the prices of a single product surveyed in various places involves collation with official exchange rates. Measurement of the price level vis-à-vis official exchange rates between currencies is thus obtained. Such measurement, for convenience, is best known as price level index (100 is given as the average of price levels for places involved in the comparative study).

If, for a given product and for a given place, the price level index diverges greatly from 100 (when this is not noted for the other places), such circumstances may still be explained by the fact that (foreseen) consistency which was not forthcoming with regard to exchange rates may, instead, come about with regard to parities.

It would therefore be sufficient to calculate the price level indices vis-à-vis global PPP's, then vis-à-vis lower and lower level aggregate parities containing groups of more and more homogeneous products, until the aggregate of the basic heading is reached (or even the aggregate of the single product in question). This last exceptional situation would feature all level indices at 100 since the prices of a single product are clearly consistent with regard to themselves (from the spatial point of view). From the practical point of view, it is best to concentrate on the basic heading and to control that the difference between 100 and the new value of the price level index falls - and, also, that scatter (around the value 100) of the values of the price level index in various places for the given product lessens.

The underlying hypothesis for this manner of proceeding remains that of seeking out a reason behind data which appear strange at first glance with regard to relative price structures (from the spatial point of view) for homogeneous groups of products. For example, a model of refrigerator in country A has a very high ECU price compared with other countries. A control must be carried out to verify if this has come about only for this specific refrigerator model or whether the entire group of refrigerators also feature relatively high prices for country A vis-à-vis other countries. Should this be so, an explanation has been found for the circumstance in question and a value of the price level index close to 100 will also be obtained when calculation of such index is calculated in relation to the parities of the group of products concerning the refrigerators. If this is not so, for country A and the product in question, performance diverges from the relative homogeneity hypothesis (from the spatial point of view) for the entire group of products which come under the basic heading. In fact, this circumstance will lead to a request for further control of the surveyed price.

An index of variability of level indices also indicates whether this circumstance is isolated within the group.

The request for further control of data on a local level (i.e. the place where the price was surveyed) may lead to the discovery that the circumstance revealed might be determined by a number of factors such as, for example, the following:

- particular market situation;
- comparability problems from the quality angle;
- not sufficiently exhaustive definition of product;
- not sufficiently clear definition of product;
- product not characteristic (representative) of the basic-heading;
- simple material error (e.g. error occurring during conversion to desired unit);
- other reason;
- exact information and no specific explanation.

According to the explanations given, the data may be confirmed, corrected or eliminated. If more complicated situations arise, such analysis may lead to discussion as to the definition of products or the representativeness of given products vis-à-vis basic heading and/or product homogeneity vis-à-vis a specific basic heading.

Here, the most appropriate decisions for each situation are not given - but it may be remarked that such decisions are made, of course, with a view to improving data from the qualitative point of view, in that such data should be improved in terms of its suitability for the tasks such data must absorb.

The matrices, one for each basic heading, are made up of the level indices for each product and for each place. They may undergo more refined statistical analyses involving calculation for appropriate "tests" - but only after the difficulty arising out of the fact that such matrices feature many missing elements has been overcome. The vector of parities or of indices of level of basic heading, however, does not generally have missing elements.

No automatic corrections are foreseen for the method, but it does provide guidelines regarding elimination of possible material errors or possible causes of bias. Furthermore, from the procedural point of view, consistency of corrections made may be verified. In any case, price comparison is improved. The method also provides guidelines for possible improvement of definitions of products or, in exceptional cases, for breakdown of a definition of products into two sub-definitions endowed with greater selectivity (as a means of eliminating residual differences of quality and therefore as a means of meliorating pure comparison of prices).

"Table" for control and validation of price data

For each basic heading, a group of tables is planned as follows:

- a) a table with information concerning the basic heading as a whole;
- b) a set of tables all of the same kind - one for each product coming under the basic heading.

In order to clearly illustrate the content of the tables and the simple formulae adopted, the scheme of the tables is provided. The tables will also feature simple symbols and formulae as an aid to comprehension.

a) Table concerning the basic heading as a whole

Basic Heading						
Code number	Short definition			Average weight	Number of products	Variation coefficient (average)
BHCV	BHSD			BHAW	BHN	BHVC

Country	Exchange rate 1Ecu = ...	Purchasing Power Parity 1CUP = ...	Price level index	Weight (/100000)	Num. of products	Variation Coefficient
1	ECU ₁	BHCUP ₁	BHPLI ₁	BHW ₁	BHN ₁	BHVC ₁
....
i	ECU _i	BHCUP _i	BHPLI _i	BHW _i	BHN _i	BHVC _i
....
k	ECU _k	BHCUP _k	BHPLI _k	BHW _k	BHN _k	BHVC _k

With regard to this first table, the following points should be made.

- The basic heading (BH) is the lowest aggregate level made up of a fairly homogeneous group of products reflected in a sample of products from said group.
- "i" indicates the generic place (e.g. country); "k" indicates the number of places involved in the comparative study.
- "BHAW" is the average weight of the basic heading; it is useful to know the relative mean importance of the basic heading of which the prices of the component products are being analysed.

$$\text{BHAW} = (\text{BHTOT} / \text{TOT}) \times 100000$$

where:

BHTOT = total expenditure in ECU of k places for the basic heading

TOT = total expenditure in ECU of k places for final household consumption

Conversion into ECU is a choice which may concern comparison within the EU. Of course, elsewhere, conversion into an alternative single currency may be carried out (e.g. the US dollar, etc.).

- "BHN" is the number of products in the sample that represents the basic heading
- "BHVC" is the average of the variation coefficients of the level indices (PVC_j) of prices separately for each product (see below). The BHVC value permits an initial global assessment of quality of the basic heading: if it is low, there is satisfactory global homogeneity of relative prices (from the spatial point of view) for the sample of products; if it is high, analysis of products must be carried out singly (tab. b).

$$\text{BHVC} = \frac{\sum_{j=1}^h \text{PVC}_j}{h} \quad (h = \text{number of the products of the basic heading})$$

- "ECU_i" is the official exchange rate vis-à-vis a single reference currency (here, ECU), and it is given with the value in currency of place "i" corresponding to a unit of the common reference currency.
- "BHCUP_i" is purchasing power parity for the basic heading for place "i" calculated with a transitive type formula (e.g. EKS). This means that the parities of "k" places may be given by means of any vector (of k elements) belonging to a set of vectors which differ among themselves for a "scalar" (multiplicative coefficient) which may be used to select a "conventional unit to express parities" (named here "CUP"). For aggregate parities there is already a well-known conventional unit known as "SPA" ("Standard of purchasing power"), obtained by laying down numerical equality of aggregates given in ECU and SPA. In the case examined here, however, use of SPA does not facilitate matters. A definition has therefore been provided for another unit which, to facilitate comparison with the ECU, is the same size and which the author of this paper has called CUP. In the table, BHCUP_i is the parity, for the basic heading, of place "i" given by value CUP_i of the unit CUP.

$$BHCUP_i = \frac{PPP_i}{G(PPP)} * G(ECU) = PPP_i * \sqrt[k]{\prod_{i=1}^k \frac{ECU_i}{PPP_i}}$$

where:

G is the symbol of geometric mean

PPP_i is the transitive purchasing power parity expressed in any conventional unit

G(CUP) = G(ECU)

- "BHPLI_i" is the price level index of basic heading for place "i". The level index for the set of "k" places is 100, in the sense that the geometric mean of such indices is 100. For example BHPLI = 105 indicates a price level for country "i" which is more than 5% higher than the average among the remaining k places.

$$BHPLI_i = \frac{BHCUP_i}{ECU_i} * 100$$

$$G(BHPLI) = \frac{G(CUP)}{G(ECU)} * 100 = 100$$

- "BHW_i" is the weight of the basic heading (total of final household consumption given as 100000) for place "i". It is useful for information on the relative importance ascribed to parities by place "i".
- "BHN_i" is the number of products for which price specifications have been surveyed in place "i". It is useful to examine it together with weight BHW_i and variation coefficient BHVC_i (see point below).
- "BHVC_i" is the variation coefficient the calculation of which is based on values of price level index of N_i products in place "i" (0 < BHN_i ≤ h). A high BHN_i number and a low BHVC_i value indicate that parity estimates are consistent with our hypothesis and therefore that results are to be considered reliable for place "i".

$$BHVC_i = \frac{s(CPLI_i)}{A(CPLI_i)} * 100$$

dove:

$$s(CPLI_i) = \sqrt{\frac{\sum_{j=1}^{BHN_i} [CPLI_{ij} - A(CPLI_i)]^2}{BHN_i}}$$

$$A(CPLI_i) = \frac{\sum_{j=1}^{BHN_i} CPLI_{ij}}{BHN_i}$$

0 < BHN_i < h

BHN_i = number of products with prices of the place "i"

b) Table concerning each product coming under the basic heading

Prodotto P _j della posizione elementare (j = 1 to h)											
Code number		Short definition						Variation coefficient			
PCN _j		PSD _j						PVC _j			
Country	Product price in local money	characteristic product (=*)	Number of quotations	Variation coefficient of quotations	Variation coeff. warning	Ecu-price	Ecu-price level index	Ecu-price warning	CUP-price	CUP-price level index	CUP-price warning
1	LMP ₁	AST ₁	NQ ₁	QVC ₁	VCWN ₁	EP ₁	EPL ₁	EPWN ₁	CP ₁	CPLI ₁	CPWN ₁
....
i	LMP _i	AST _i	NQ _i	QVC _i	VCWN _i	EP _i	EPL _i	EPWN _i	CP _i	CPLI _i	CPWN _i
....
k'	LMP _{k'}	AST _{k'}	NQ _{k'}	QVC _{k'}	VCWN _{k'}	EP _{k'}	EPL _{k'}	EPWN _{k'}	CP _{k'}	CPLI _{k'}	CPWN _{k'}

With regard to this second table, the following points must be made:

- the table, drawn up for each P_j product coming under the basic heading contains information useful for analysis of comparison of prices of each product of the k' places where prices are collected (0 < k' ≤ k).
- "PVC_j" is the variation coefficient of "CPL_{li}" values of the level index defined below (penultimate column of table).
- This is helpful in assessing consistency of values of index of price level with regard to basic heading (for low values of variation coefficient there is satisfactory consistency between product "j" and the set of products coming under the basic heading and therefore, presumably, a fair likelihood that the product is representative of the basic heading). It might also be useful to calculate the correlation between level indices EPL_{li} BHPL_{li}.
- "LMP_i" is the price of the product in the currency of place "i" (average surveyed price).
- "AST_i" represents the asterisk sign "*" which must appear only if the product is considered "characteristic" of place "i" (if this is not the case, no symbol appears). In general, it is believed that a "characteristic" product is most widespread within the market of place "i" so that there should be a high NQ_i number of price specifications and an EPL_{li} price level indicator, and/or CPL_{li}, of less than 100 (or in any case close to 100). The fact is, however, that, due to particular market situations, this often does not come about. This is why it is not easy to automatically ascribe a "*" symbol to single products of single places (it is recommended to refer to the information directly verified in said places). Correct ascription of these "*" symbols is important for arriving at an estimate of "equi-characteristics" parities - dealt with above. Careful examination of the table is useful as a means of retrospectively controlling consistency between "characteristicity" (AST_i = *), number of specifications (NQ_i), variability of price specifications (QVC_i) and price levels (EPL_{li} and CPL_{li}) with pertaining warnings (EPWN_i and CPWN_i).
- "NQ_i" is the number of price specifications surveyed for product "j" in place "i". It should be relatively high if the product is "characteristic" of the place. The price specifications may come from various kinds of sales outlets (which vary according to form of sale and related services for consumers - large scale distribution, corner shops etc.). For analysis broken down according to type of outlet, separate tables must be consulted both with regard to the product and type of sales outlet, with separate parity estimates according to type of retail outlet. Of course, this is only possible if a sufficient quantity of price specifications is available for each retail trade distribution type.
- "QVC_i" is the variation coefficient of the price quotations of product "j" in place "i".
- This is a measurement of the scatter of prices in place "i" indicating degree of reliability of average price estimate and therefore of consequent parity.
- "EP_i" is the average price, given in a single currency (in this case, ECU - using the official exchange rate) of product "j" in place "i".

$$E P I _ i = \frac{L M P _ i}{E C U _ i}$$

- "EPLi" is the price level index collated with "exchange rate" for product "j" and place "i". It is obtained as ratio of price EP_i and the geometric mean of said EP_i prices of k places (multiply result by 100):

$$EPLi = \frac{EP_i}{\sqrt[k']{\prod_{i=1}^{k'} EP_i}} * 100 = \frac{EP_i}{G(EP)} * 100$$

where: $0 < k' \leq k$ (k' = number of the places - e.g.: countries - with prices for the product "j")
 $G(EPLi) = 100$ (G = geometric mean)

- "EPW_{Ni}" is a warning (WN), indicating that the level index has exceeded one of three levels of difference from 100. The three levels may be established as follows:
 - a) in absolute terms (e.g. values outside ranges 50-200, 65-150 and 82-120 - consider values falling within 82-120 range consistent);
 - b) in relative terms - relating to variability of level indices of various places ($i=1, k$).
- "CPi" is the price of product "j" and of place "i" in "CUP" which is a conventional unit of expression of parities of the basic heading (see above). It is given as:

$$CP_i = \frac{LMP_i}{BHCUP_i}$$

- "CPLi" is the price level index vis-à-vis parity of basic heading for product "j" and place "i". It is obtained as ratio of CUP_i price and geometric mean of said CUP_i prices of k (multiply result by 100):

$$CPLi = \frac{CP_i}{\sqrt[k']{\prod_{i=1}^{k'} CP_i}} * 100 = \frac{CP_i}{G(CP)} * 100$$

where: $0 < k' \leq k$ (k' = number of the places - e.g.: countries - with prices for the product "j")
 $G(CPLi) = 100$ (G = geometric mean)

- "CPW_{Ni}" is a warning, the same rules applying as those already noted for "EPW_{Ni}".

If comparison of the level index EPLi is carried out for prices (with regard to exchange rates) and CPLi level index values for the same prices (with regard to parity of basic heading), or if, more simply, comparison is carried out of the EPW_{Ni} and CPW_{Ni} warnings, the following helpful deductions may be made.

- a) no warnings: price consistency (mean value of surveyed price specifications) both with regard to exchange rates and basic parities.

- b) "EPW_{Ni}" warning without "CPW_{Ni}" warning: inconsistency as regards price vis-à-vis exchange rate, no longer noted due to satisfactory consistency of price vis-à-vis parity of basic heading. What is noted is a group of products (basic heading) which perform consistently (from the spatial point of view) within the group itself.
- c) both warnings: according to level of warnings, inconsistency of varying intensity is noted during spatial comparison of prices. It is therefore advised to carry out in-depth analysis or control to find a reason for such circumstances and to duly make decisions on the basis of such analysis or control. The inconsistency must be considered more serious if the absolute difference (vis-à-vis 100) increases by a zero moving from EPL_i to CPL_i, since it runs counter to the hypothesis according to which greater consistency of price comparisons is foreseen within a basic heading.

Extension of method to quality control of prices within national boundaries for both spatial and time comparison

The method and the pertaining tables may be used not just for analysis of prices for estimate of spatial indices internationally but also, clearly, nationally. Of course, here, the exchange rate is, by definition, equal to 1 and therefore the "EPLI" level indices are derived directly from prices surveyed in various places (e.g. cities). On the other hand, there are no changes as regards calculation of "CPLI" level indices. Variability indices and warnings will indicate cases of spatial inconsistency of prices (e.g. between cities) for which further control is required before validation.

A control of prices surveyed based on a search for inconsistency on the level of spatial comparison may be utilised - although the difficulties encountered are greater - during the calculation procedures for time price indices.

In this case, however, there generally is a lack of spatial comparability of price specifications vis-à-vis a single definition for a given product. It is therefore necessary to carry out much preliminary work in order to provide a single code for price specifications referring to products considered as "identical" or in any case "comparable". These codes make up a basic heading and, taken together, go on to constitute the new (formally) more comprehensive group of products which are considered as differing among themselves in terms of quality and which make up the new more comprehensive sample which is representative of the basic heading. With these new codes it is possible to try to calculate PPPs.

If the available data, taken as a whole, permit spatial comparisons of prices and estimates of spatial indices, even with partial coverage of areas, tables of the kind examined may still be useful for inconsistency controls and for control on the basis of quality assessment on the spatial level. Furthermore, consistency of relative prices (in the spatial sense) are a sure index of reliability of data and constitute an important piece of statistical information.

Conclusions

The table which was originally proposed by the author, as was the method described here, is presently being used by Eurostat in the above form. It is useful for analysis of prices surveyed in the various countries taking part in the European spatial (ECP) Comparison Programme for prices (purchasing power parity - PPP) and for the aggregates of National Accounting in real terms (volume ratios): these are analyses which constitute one of the many interventions and instances of initiatives directed toward ongoing improvement of the quality of parity of purchasing power estimation.

With the help of the data contained in the above mentioned table, at the end of each price survey for a given group of articles, Eurostat brings out a detailed and most useful report on the data collected in 19 countries. Eurostat, for each group of articles, indicates which cases require further controls and, on occasion, provides possible explanations and/or solutions for the cases in question. Individual countries are therefore placed in a position whereby they can diligently carry out all investigation armed with sufficient knowledge. The general quality of purchasing power parities (as spatial deflators of the value relations of Gross Domestic Product and of its component aggregates) depends on the quality of the entire set of data as well as on the quality of the other aspects of the complex process of indirect estimation.

Numerical examples

Two numeric examples from European Comparisons Programme works carried out by Eurostat, are presented: the first case regards products noted as “identical” above, and the second deals with the case of products identified above as “comparable”.

Example 1 (“identical” products case)

For “identical” products we mean those which correspond to the same brand and model, as for example, occurs in the case of cars. Indices at the level of basic parity price heading (cod. 61113), with respect to exchange rates, are reported in the table of type a), while in type b) table, indices at the level of prices for a single product (cod. 61113o) in the basic heading, both in regard to exchange rates and to the basic parity heading are listed.

Tab. a

61113 Motorcars other than diesel-engined cubic capacity more than 1200 cc and less than 1700 cc

country	price level index	country	price level index	country	price level index	country	price level index
1	86,17	5	85,89	9	157,66	13	101,99
2	95,43	6	88,02	10	117,14	14	78,91
3	80,28	7	95,51	11	94,91	15	91,64
4	106,35	8	116,02	12	117,49	16	111,93

(data source: Eurostat - 1993 second semester survey)

Tab. b

61113o Motorcar of specific brand and model with engine cubic capacity of 1400 cc
(symbol "*" is used for a representative product in the basic-heading group)

country	national currency price	num. of quot.	variation coeffic.	wn	price in ecu	price level index	wn	price in cup (ppp unity)	price level index	w n
1	21541,50*	2	3,67%		11029,95	84		12799,98	97	
2	-	-	-		-	-	-	-	-	
3	19076600*	1	0%		10510,52	80	◆	13091,63	99	
4	30405,50*	2	1,08%		13871,12	105		13043,25	99	
5	436460*	1	0%		10865,32	82	◆	12650,31	96	
6	497450*	1	0%		12383,62	94		14069,85	107	
7	9624,75*	1	0%		12240,56	93		12815,84	97	
8	11990*	1	0%		14968,79	113		12902,05	98	
9	156058*	1	0%		20821,61	158	◆◆	13206,57	100	
10	4450000	1	0%		16748,21	127	◆	14297,68	108	
11	1894000	1	0%		12937,16	98		13631,20	103	
12	2797529*	1	0%		15212,23	115		12947,42	98	
13	177000	1	0%		12882,10	98		12630,37	96	
14	18650*	1	0%		10584,56	80	◆	13413,05	102	
15	-	-	-		-	-		-	-	
16	-	-	-		-	-		-	-	
variation coefficient:					20,92			3,78		

(data source: Eurostat - 1993 second semester survey)

Tab. c - Correlation between exchange rates, parity and prices.

Correlation coefficients between:	
- exchange rates and prices of the product in national currency	0,9956
- exchange rates and basic-heading parities	0,9969
- basic-heading parities and prices of the product in national currency	0,9998

Tab. d - Correlation between price level indices.

Correlation coefficients between price level indices concerning:	
- the prices of the product converted into ecu (exchange rate) and the same prices converted into cup (basic-heading PPP)	0,2247
- the prices of the product converted into ecu (exchange rate) and the basic-heading parities relative to exchange rates (ecu)	0,9824

In this example, one can note clearly, both through an analytical examination of indices values at the price level, and through a synthetic examination of the values of coefficients of variation and of coefficients of correlation, that prices surveyed for the product are very consistent with their basic heading to be used for spatial comparison.

Example 2 (“comparable” products case)

For “comparable” products we mean those corresponding to the same definition, containing all the qualitative characteristics of a product in a precise and complete way. The goal is the following: the products, of which the prices are surveyed in different countries with respect to such a definition, must be comparable in terms of quality, and so, also of volume. In these conditions spatial comparison of prices gives a spatial (deflator) index of price (PPP).

In the field of clothing, for example, one is forced to make wide use of definitions of the kind stated. Due to this, in addition to “fashion”, which in this sector increases the difficulties of comparison of products with the goals of spatial deflation, the variability of the phenomenon is much greater than that which one encounters in the preceding example.

Tab. a

21121 Coats and similar items				av.weight: 287		n.articles: 8		var.coef.: 18,38	
country	price level index	country	price level index	country	price level index	country	price level index		
1	100,77	6	131,23	11	76,01	16	119,12		
2	117,06	7	89,72	12	66,43	17	60,72		
3	91,22	8	107,59	13	78,08	18	143,99		
4	86,70	9	116,83	14	96,41	19	111,92		
5	103,10	10	138,91	15	114,14				

(data source: Eurostat - 1994 second semester survey)

Tab. b

21121a Ladies' coat (specific defined product)

(symbol "*" is used for a representative product in the basic-heading group)

country	national currency price	num. of quot.	variation coeffic.	wn	price in ecu	price level index	wn	price in cup unity	price level index	w n
1	530,67*	15	23,68%		275,74	118		273,64	117	
2	2127,50*	6	18,98%		323,20	138	♦	276,09	118	
3	406998,23*	13	20,49%		212,53	91		232,99	100	
4	417,72*	18	31,17%	◇	193,54	83		223,22	96	
5	7824*	4	45,61%	◇	197,29	84		191,37	82	♦
6	12899,44*	9	14,80%		325,28	139	♦	247,86	106	
7	115*	2	13,05%		148,21	63	♦♦	165,20	71	♦
8	211,26*	22	44,08%	◇	266,20	114		247,42	106	
9	1893,43*	7	30,31%	◇	251,01	107		214,85	92	
10	86963,64*	11	15,47%		301,93	129	♦	217,35	93	
11	26965*	10	29,93%		169,68	73	♦	223,23	96	
12	30021,67*	12	10,54%		152,47	65	♦♦	229,54	98	
13	2858,50*	6	37,91%	◇	211,12	90		270,39	116	
14	385*	5	40,71%	◇	237,47	102		246,30	105	
15	2308,80*	5	41,99%	◇	251,97	108		220,75	95	
16	1593,73*	15	32,83%	◇	257,44	110		216,11	93	
17	3400000*	3	4,1%		125,77	54	♦♦♦	207,11	89	
18	29257*	5	22,95%		352,04	151	♦	244,48	105	
19	3198	8	19,37%		381,89	163	♦♦	341,21	146	♦
variation coefficient:						28,6		15,4		

(data source: Eurostat - 1994 second semester survey)

Tab. c - Correlation between exchange rates, parity and prices.

Correlation coefficients between:

- exchange rates and prices of the product in national currency	0,9988
- exchange rates and basic-heading parities	0,9993
- basic-heading parities and prices of the product in national currency	0,9999

Tab. d - Correlation between price level indices.

Correlation coefficients between price level indices concerning:

- the prices of the product converted into ecu (exchange rate) and the same prices converted into cup (basic-heading PPP)	0,6756
- the prices of the product converted into ecu (exchange rate) and the basic-heading parities relative to exchange rates (ecu)	0,8406

In this example certain variability in the quotation price can be noted, with 8 cases of high variability indicated. The variability of the indices at price level goes from 28.6% to 15.4 %, with a decrease that is not very serious, but acceptable if one considers the average variability in the basic heading (18.38% tab. a). The tab. d coefficients of correlation also give the same overall evaluation of prices of the product examined, while the data of tab. c are less notable with regard to the type of control that we are carrying out.

Bibliography

- **Eurostat**, Comparison in real terms of the aggregates of ESA - results for 1992 and 1993, Luxembourg, 1995 (Theme 2: Economy and finance. Series C: Accounts and surveys, 1 vol., 69 pp.)
- **Eurostat**, How to read the “Q. Table”. Working document of Working Party on “Consumer price statistics”, Luxembourg, June 1995 (5 pp.).
- **Ferrari, G.** - Riani, M., A new approach to purchasing power parities calculation at the basic headings level and related topics. Università di Firenze, Firenze, 1994.
- **Gerardi Dino**, Selected problems of inter-country comparisons on the basis of experience of the Eec. Review of Income and Wealth, dic. 1982 (pp. 381-405).
- **Gini Corrado**, On the circular test of index numbers. Metron, 1931. No. 2 (pp. 3-24).
- **Hill P.**, Multilateral measurements of purchasing power and real Gdp. Hill report, Eurostat, Luxembourg, 1982 (1 vol., pp.61).
- **Kravis Irving B., Kenessey Zoltan, Heston Alan W., Summers Robert**, A system of international comparisons of gross product and purchasing power, United Nations International Comparison Project: Phase I. Johns Hopkins University Press, Baltimore, Md., 1975 (1 vol.).
- **Vincenzo Quaranta**, Publication des prix absolus - modalité. Document de travail du Group de travail “Statistiques de prix”, Eurostat, Luxembourg, février 1990 (9 pp.).
- **Vincenzo Quaranta**, I raffronti internazionali del prodotto interno lordo. Rassegna di Statistiche del Lavoro, Confindustria, Nuova serie - anno 40° - N. 1 - gen/mar 1989 (pp. 69-76).