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**DATA REQUIREMENTS, PRESENTATION AND MAIN USES OF SEASONALLY ADJUSTED
CONSUMER PRICE INDICES**

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Prepared by Roberto Sabbatini, Bank of Italy, Research Department

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DATA REQUIREMENTS, PRESENTATION AND MAIN USES OF SEASONALLY ADJUSTED CONSUMER PRICE INDICES

by Roberto Sabbatini¹

Introduction

In this paper we focus on issues related to the estimation, presentation and use of seasonally adjusted (SA) consumer price indices. Our analysis is largely based on the experience accumulated at the Bank of Italy; hence, we take the point of view of a user of SA price indices, who has to monitor and assess the inflationary outlook. We also investigate the reasons underlying a situation in which seasonally adjusted consumer price indices, with few exceptions, are never published and/or used in the official documents by National Central Banks (NCBs) and National Statistical Institutes (NSIs), in spite of the efforts devoted over the last years in analysing the various aspects of their computation. Some of the issues we have decided to deal with in this paper reflect our view that the estimation and presentation of SA price indices cannot be treated separately from the use one is going to make of such data. Our main conclusion is that in this field a close co-operation between “producer” and “users” of such statistics is necessary.

Policy-maker greatly benefit from the statistical analysis of economic time series, which provides them with information that can facilitate the short-term monitoring of economic trends. Since the short-term variability of economic time series often exhibits a seasonal pattern, it is only by removing seasonal factors that turning points can be promptly identified; they cannot be readily identified either by changes over the previous period calculated on the raw data (which are affected by seasonal factors) or by changes over the corresponding period of the previous year (which reveal turning points long after they have occurred, since they are affected by developments over the whole year). SA price indices are also largely used in the short-term forecasting of inflation.

In the following, we first look briefly at the “ideal” characteristics that consumer price indices released by NSIs should present in order to facilitate the statistical decomposition. This issue is important to understand why SA consumer price indices are hardly ever used in the economic analysis of inflation. Second, we turn to issues related to the presentation of SA price indices and to the problem of revisions. In the final section we present the current national practices.

Our analysis will take as a benchmark the situation we face in the seasonal adjustment of the HICP for the euro area. In this paper we do not deal with strictly methodological issues related to the estimation of SA consumer prices (e.g. which method should be adopted), which have already been extensively discussed elsewhere.

¹ Bank of Italy, Research Department. Ph. 39+06+47922157. E-mail: sabbatini.roberto@insedia.interbusiness.it.

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1. The estimate of the seasonal component of consumer prices: data requirements.

The estimation of SA data requires several choices, concerning for example the method to use, the best time span to consider, the treatment of outliers and of other fixed effects, the use of a direct or of an indirect approach. Here our aim is to define what characteristics of data released by the NSIs would facilitate the statistical decomposition and the interpretation of SA figures.

a) The choice of the time interval

The selection of the optimal time interval to estimate the seasonal component is based on the following considerations. On the one hand, using a longer time span (at least 10 years) facilitates the statistical decomposition of the original series. On the other hand, we may run into problems of structural changes over time in the behaviour of the series, which may affect the quality of the seasonal adjustment. Such breaks are sometimes due to economic events (e.g. the German reunification); more often, they can be attributed to the introduction of methodological changes in the computation of the raw data. This aspect has direct practical implications for the producers of such statistics (NSIs). In particular when they introduce a new methodology which implies a structural break in the price series, backdata should be provided for a reasonably long period of time. The current practice adopted by Eurostat to provide backdata only for one year in case of major changes is not adequate from the users' viewpoint.

b) The "direct" versus the "indirect" seasonal adjustment

If one deals with statistics at the euro area level a crucial issue is the decision to proceed by seasonally adjusting euro-area aggregates directly ("direct" approach) or dealing first with national components (or sector components), which are then aggregated to compute SA indices for the euro area ("indirect" approach). The indirect approach guarantees consistency between the overall series and its components. From the point of view of a user the indirect method is superior: it allows for a better analysis of inflationary tendencies since the overall (SA) variation can be split into those of the components.

In the context of euro area aggregates the indirect approach can be applied (a) either to the raw sub-indices for the euro area (e.g. unprocessed food, non-energy industrial goods, services, etc.), which are first seasonally adjusted and then aggregated into the euro area overall index, or (b) to the corresponding national series (overall HICP for the 12 countries). In our view the adoption of the indirect approach is the best way forward since a user involved in monitoring inflation will always try to establish which country or what component is driving euro area inflation upwards or downwards.

The implementation of an indirect method has important implications in terms of the "optimal" level of disaggregation of consumer price series which should be released by the NSIs. The experience accumulated with the Italian CPI can provide useful insights. The Bank of Italy estimates the SA CPI following an indirect approach. The statistical decomposition is performed separately for the following components:

- unregulated food prices (unprocessed and processed)
- unregulated non-energy industrial goods prices
- unregulated services

- rents (their seasonal patterns is mainly spurious, being related to the quarterly frequency of collection of these series)².

In the case of Italy the same indirect approach could not be implemented for the HICP (in principle the same should hold for the other countries of the euro area). The level of detail released by Eurostat for this index is in fact much lower than that which is made available by Istat for the national CPI (around 80 and 200 elementary series, respectively). In particular, the disaggregation for the HICP is not suitable for distinguishing between regulated and non-regulated prices. It can be shown that the estimate of the seasonal component of the Italian HICP without distinguishing between regulated and unregulated prices would not be as accurate as that for the national CPI.

c) The treatment of outliers

In the statistical decomposition of a time series an important issue concerns the preliminary identification and removal of outliers, whose presence would otherwise bias the estimates of the various components. This can be done by using specific routines which are automatically implemented in all the main statistical software available for seasonal adjustment, or just using judgmental criteria.

In the case of the consumer price index, large outliers are often due to changes in indirect taxes (VAT rates and excise duties), which lead to one-off rises in the price level. When *a priori* information on changes in indirect taxes is available, the possibility of exploiting it to "quantify" its contribution to the index in a given month rather than implementing automatic procedures should be considered. In practice, in order to perform this procedure, specific information is needed, regarding (i) the indices net of indirect tax changes (with the same disaggregation as that available for the original series) and (ii) the time series of VAT rates for each item.

2. The presentation of seasonally adjusted consumer prices

The presentation of SA figures cannot be separated from their use. SA series are not fully informative of the inflationary outlook, being affected by irregular changes. The presence of the irregular component in the SA series requires a careful use of such data; an assessment of the contribution of erratic changes to the month-to-month percentage changes is needed before drawing any conclusion on what SA data reveal on the inflationary outlook.

The contribution of the irregular component to monthly inflation can be estimated either by implementing a statistical filter (i.e. by estimating a trend-cycle – TC – series for the considered index), or on a judgmental basis, that is by looking at price developments of the various items which are included in the considered SA series, trying to detect if any of them is responsible for the observed erratic change in the month-to-month variation of the SA price index.

The estimation of the TC series apparently represents a simplification for the user, since the removal of the irregular components is automatically performed on the basis of a statistical filter. However, this solution is subject to a few shortcomings:

² It is worth remarking that (i) regulated prices are not seasonally adjusted, since they are changed in specific periods of the year but not necessarily in the same month, and (ii) energy prices are not seasonally adjusted, due to the fact that their short-term variability is dominated by the irregular component.

1. the estimate of the TC series is derived from the aggregate original series. Hence, the information on which item is mainly responsible for the erratic changes, which is potentially contained in the disaggregated series, is not exploited;
2. from a strictly statistical point of view, the estimate of the TC series tends to converge more rapidly than the seasonal adjusted series but at the price of larger revisions in the series. Hence, the policy-maker, by using the TC series, might have to revise substantially its evaluation of inflationary tendencies for a given period after few months.

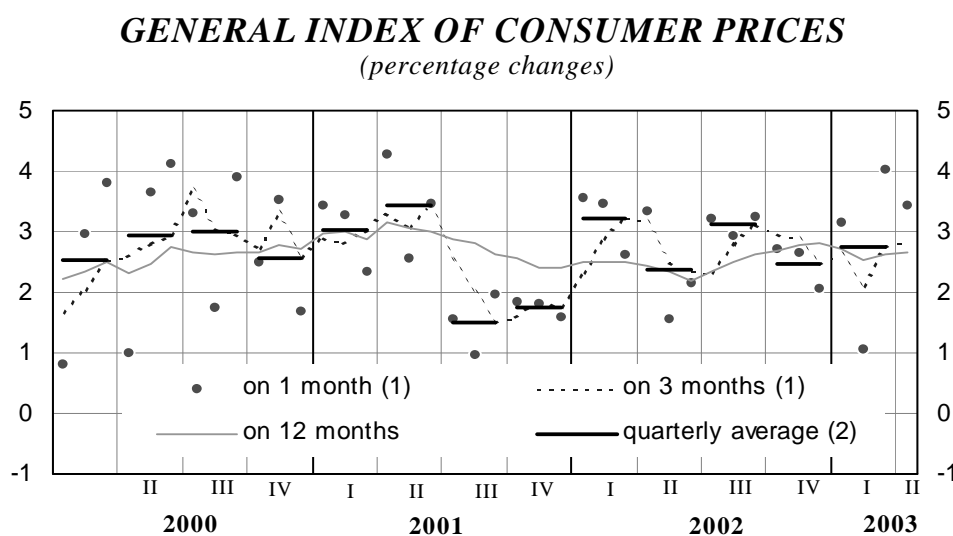
The main problem faced in implementing a judgmental approach lies in the definition of what can be defined as an “erratic change”. In this respect, when looking at price changes of disaggregated data one faces three possibilities:

1. some erratic movements of specific items have, clearly, a temporary and reversible impact on headline inflation (an example is the temporary rise in football ticket prices determined by an important match);
2. other shocks have longer lasting effects; for instance, a jump in oil prices can propagate over time through the action of the so-called “second round effects”. This propagation also depends on the impact on agents’ expectations, which in turn are affected by the reaction of the policy-maker to the initial shocks. In these circumstances, by simply removing the energy price change contribution from the SA figures can be misleading for a proper assessment of the inflationary outlook, since an important source of potential future inflationary pressures is disregarded;
3. an intermediate situation occurs when the price of a specific item is adjusted, for instance, once a year (and typically by a substantial amount), though the precise month in which the adjustment takes place changes from year to year. This happens rather frequently in the case of regulated prices. In these circumstances, the assessment of the inflationary outlook is biased in the month in which the change takes place, since the change of the index which is observed is likely to be quite large but at the same time it cannot be interpreted as an erratic movement. More appropriately, the contribution of such movements should be evaluated on a longer term perspective.

We believe that an approach based on the use of the TC series is not satisfactory, since the information provided by disaggregated price indices is not exploited efficiently; its careful use could help in establishing which items are responsible for erratic changes, to what extent such erratic changes can affect inflation over the medium term or whether such contribution will reverse shortly. Hence, when disaggregated data are available, a judgmental approach is likely to be more fruitful. The purpose of the analysis is to explain the “extreme” movements of SA inflation rates in the context of a medium term view of the inflationary outlook, formed on the basis of a preliminary analysis of inflationary pressures and possibly supported by medium term macroeconomic forecasts. In doing this the user of SA data tries, essentially, to reconcile his/her own interpretation of SA figures with his/her broader view of the inflationary outlook (including forecasts). SA figures can confirm such view or can raise doubts on it. In this respect, SA data act as a sort of “alarm bell”.

The above discussion has important implications in terms of what piece of information should be published. The economic interpretation of SA figures should be based on month-to-month percentage changes (better if annualised). Since these changes are likely to be highly volatile, due to the impact of the erratic component, a pragmatic way to smooth out the above irregularities is by taking 3-month percentage changes of SA indices, which are still affected by the erratic contribution, but to a lesser extent, and can be presented to the general public more easily (see Fig. 1 for the Italian CPI).

Fig. 1



The publication of SA indices (levels) is an obvious requirements as it allows users to compute the above changes themselves; methodological details should also be made explicit. However, what in our view is crucial from the point of view of the user is that a detailed set of elementary series is released together with the SA series. Unless such piece of information is not available, a fruitful use of SA data is seriously jeopardised.

3. How to deal with revisions?

The estimate of the seasonal component based on the use of a symmetric filter, which as well-documented is “optimal” from a statistical point of view, implies a revision in SA data any time a new observation is made available. Such revisions are “optimal”, in a sense, being induced by the use of all data which are available. However, when the estimate of the seasonal component shows to be quite stable over time, as it is often the case with price series, a simplification could be achieved by maintaining unchanged the seasonal coefficients for 12 months, hence revising the whole series only once a year. This is an enormous simplification for the user and it is the current practice we follow at the Bank of Italy. Alternatively, a less restrictive solution can be to maintain unchanged the ARIMA model and the main options of the statistical procedure which is adopted for 12 months, though re-estimating the SA series every month on the basis of the updated actual weights of the statistical filter, presumably revised as a consequence of the fact that new data have been taken into account. The choice between the above options depends, critically, on the degree of stability of the seasonal component, which should be carefully assessed.

On the basis of our experience with price series for the euro area, the solution of keeping constant for one year the seasonal factors seems to be the appropriate one.

4. National practises

On the basis of the information collected last April from the web-sites of the NSIs and the NCBs of industrialised countries³, the conclusion is that almost none of them refers to SA price indices in the economic analysis of inflation. The few exceptions are Germany and Italy, among the NCBs, and Germany and UK, among the NSIs (Table 1). This does not exclude the possibility that SA price indices are used for internal purposes while they are not published or used in the economic analysis for instance because of the difficulties to explain them to the public.

Table 1b – SA price indices published by the National Statistical Institutes (1)

Country	Consulted Publications	Use of SA price indices	Details
Austria			
Belgium		No	
Finland		No	
France	Informations Rapides	No	CPI e PPI
Germany		Yes	CPI and PPI; Total Index. For the TC series and the SA series, both the levels and the month-to-month percentage changes are published; for the irregular component, its value is given.
Greece		No	
Ireland	CSO Publication	No	
Italy		No	
Luxembourg	Bulletin du Statec	No	
The Netherlands		No	
Portugal		No	
Spain	Nota de prensa	No	
UK	Monthly Digest of Statistics (Nov. 02)	Yes	PPI and CPI (Retail Price Index) SA levels are published, for the overall index and its main categories. PPI, overall index; levels.
	Economic Trends (Mar. 03) (3)	Yes	

Source: based on information downloaded from the web-sites in April 2003.

³ We checked only those publications available in English on the NSIs and NCBs web-site.

Table 1A – SA price indices published by the National Central Banks (1)

Country	Consulted Publications	Use of SA price indices	Details
Austria	Annual Report (2001)	No	
Belgium	Annual Report (2002) Economic Indicator (25/4/03)	No No	
Finland	Bulletin (2002.4) Annual Report (2001) Main Indicators (17/4/2003)	No No No	
France	Annual Report (2001) Bulletin Main Economic and Financial Indicators (Apr. 2003)	No No Yes	SA HICP (overall index) for EU countries (overall index). Month-to-month changes.
Germany	Annual Report (2002) Monthly Report (Oct.02)	No Yes	Overall PPI and CPI. Monthly and quarterly levels of the indices.
Japan	Quarterly Bulletin (Feb. 03) Annual Review (2000)	No No	
Greece		No	
Ireland	Quarterly Bulletin (Spring 2003) Annual Report (2001)	No No	
Italy	Quarterly report Annual Report	Yes Yes	
Luxembourg	Annual Report (2002) Bulletin (2002/4)	No No	
The Netherlands	Annual Report (2001) Quarterly Bulletin (Mar. 03) Statistical Bulletin (Dec. 02)	No No No	
Portugal	Economic Bulletin (Dec. 02) Annual Report (2001) Statistical Bulletin (Apr. 03)	No No No	
Spain	Annual Report (2001) Statistical Supplement	No No	
Sweden	Inflation Report (18 Mar. 03) Annual Report (2001) Economic Review (2003:1)	No No No	
UK	Quarterly Bulletin (Spring 03) Inflation Report (Feb. 03)	No No	
USA	Federal Reserve Bulletin Economic Indicators (Feb. 03)	No Yes	PPI and CPI indices (overall index and main components, around 10 series); month-to-month, 3-month and 6-month percentage changes.

5. Recommendations

Almost all NSIs and NCBs of industrialised countries neither use nor publish SA price indices. This is surprising if one takes into account for the intense debate and for the large amount of resources which were devoted to this issue since the second half of the nineties. In principle, the current situation could be due to the statistical difficulties in estimating such series; we believe that a further, and possibly more important, reason lies in the difficulties in explaining to the general public how SA figures have to be interpreted. This has led us to concentrate our analysis on the linkages between the estimation of SA price indices and their uses.

A few practical recommendations can be drawn by the previous discussion. The first set of recommendations concerns improvements which would make it easier to use SA figures in the conjunctural analysis of inflation.

Recommendation 1. The publication of SA price indices must be done in the context of a broader analysis of the inflationary outlook. In particular, SA figures are useful for a prompt check of whether the most updated figures fit with our beliefs on the medium-term inflationary developments, partly based on macroeconomic forecasts. If one abstracts from this more general context, SA price indices becomes almost useless. Moreover, we doubt that the public opinion would be able to interpret these figures adequately.

Recommendation 2. We have argued that the level of detail currently provided by Eurostat for the HICP is not sufficient for a proper estimate and use of SA indices. Moreover, NSIs and Eurostat when implementing important methodological changes in the computation of the price series, which can lead to structural breaks, must take into greater consideration users' needs. For instance, the current "revision policy" followed by Eurostat for the HICP is not adequate; in particular, backdata for a reasonably long period of time should be released any time a methodological discontinuity is introduced in the computation of the raw indices.

Recommendation 3. In particular in the case of price series for the euro area, we have argued that the preference should be given to an "indirect" approach to their seasonal adjustment (either by country or by component).

Recommendation 4. A preliminary statistical evaluation of the amount of revisions in the estimate of the seasonal component is crucial; our experience with HICP series leads us to expect that keeping the seasonal component unchanged for one year would be a reasonable compromise between a "concurrent" estimate and a situation of no revisions.

The previous discussion is also helpful in evaluating which institution should be responsible for the computation of SA price indices. Having argued that the publication of SA data should be done in conjunction with their economic interpretation, it seems natural to leave the responsibility of the estimate directly to those who use SA figures. A further advantage of this strategy would be that they are specialists in a given field and they have to deal only with a limited number of time series. Moreover, the better knowledge of the user of his/her can lead to the adoption of the most appropriate strategies (e.g. with respect to the selection of sub-indices in the indirect approach). Alternatively, if the estimation is conducted directly by the NSI, the advantage is that it is usually carried out by skilled statisticians, and then more sophisticated methods can be adopted and all users would make use of the same series. However, the advantage in terms of better skills would be reduced by the fact that NSIs have to deal with a large number of series and might not be able to devote much time or attention to each of them; in addition, the more limited knowledge of the phenomenon under study might lead to the sub-optimal use of the available information.

In deciding which institution should perform the estimate of SA price indices one has also to bear in mind what he/she means by "user". Typically, one is not referring to the general public, which is, after all, only interested in the assessment of the inflationary outlook rather than in SA series and how they are obtained. Typically by "users" we mean highly specialised people who work within research departments, international organisation, investment banks and so on, who are, then, able to run all the main statistical packages which can perform the statistical decomposition in a rather user's friendly way, and which are available for free or at a very low price. This lead us to a further set of recommendations.

Recommendation 5. In the case of consumer price series, a close interaction between users and producers is crucial: the former must define their needs precisely; the latter must be willing to take into account such requirements in a flexible and transparent way. Unless such co-operation can be implemented, NSIs should made it available to users all the relevant information, but they should not perform the

statistical decomposition of the raw series. The risk is to have an “official” SA series, released by a statistical agency, which is of no use in the economic analysis since it is considered unreliable.

Recommendation 6. Assuming that the above close co-operation is achieved, the minimal information which statistical agencies should publish is the following:

- the levels of the SA price indices, in order to let users compute 1-month and 3-month percentage changes, for the overall series and its components (indirect approach);
- highly detailed elementary series (for instance in the case of Italy around 200 series are released by Istat for the national CPI);
- a full set of methodological information concerning the method which has been used, the actual options which have been implemented, the amount of revisions, and so on, in order to let professional users evaluate the quality of the seasonal adjustment which has been performed. In this respect, any major change in the underlying methodologies (e.g. the adoption of a new statistical method) should be documented in detail.

Recommendation 7. An obvious requirement is that SA price indices should be released jointly with raw data (on the same day) otherwise users will always perform the statistical decomposition on their own since they have to make a prompt assessment of the inflationary outlook as soon as new data are released.