How seasonal adjustment can affect the message delivered to policy makers

GIAN LUIGI MAZZI AND FILIPPO MOAURO

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How seasonal adjustment can affect the message delivered to policy makers: a simulation approach based on the euro area industrial production

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Abstract

Abstract: The paper discusses the problem related to seasonal adjustment of euro area short term statistics, with the implications of the availability of member states data at the end of the sample, the alternative strategies to derive the aggregate index and the recommendations of the ESS Guidelines on seasonal adjustment. The results of a simulation approach based on the industrial production are presented, with a comparison between Tramo-Seats and X-12, the treatment of outliers, the estimation of missing countries and the use of an indirect strategy to seasonal adjustment of the euro area aggregate. Results of the empirical analysis suggest that due to the recent crisis the choices regarding seasonal adjustment could affect significantly the message delivered to policy makers.

Keywords: seasonal adjustment, forecasting, outlier treatment, direct and indirect strategy.

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Authors:

Gian Luigi Mazzi ([1]) and Filippo Moauro ([2]).

([1]) Gian Luigi Mazzi, Eurostat, Luxembourg; email: gianluigi.mazzi@ec.europa.eu

([2]) Filippo Moauro, Istat, Rome, email: moauro@istat.it

1. Introduction

Key figures produced by Eurostat are usually seasonally adjusted with the exception of prices and balance of payment ones. Such data are based mainly on national ones and the way in which the European seasonal adjusted aggregates are obtained depends from one hand on the availability or not of all member states and from the other hand on the strategy adopted to perform the seasonal adjustment. Concerning the first aspect, obviously, when all member states are available, the calculation of European aggregates is simply an aggregation problem and its quality is a function of the national data quality only. Unfortunately this is rarely the case, so that in most situations the aggregation is complemented or integrated by estimation procedures which derive European aggregates from a more or less incomplete set of national information. Obviously, a minimum geographical coverage is needed in this case and a threshold is defined according to specific domain rules.

The plan of the paper is the following: the next section deals with the problem of missing member state data at the end of the sample; section 3 with seasonal adjustment of European aggregates; section 4 presents the ESS guidelines suggestions, whereas section 5 the empirical analysis of industrial production; section 6 is devoted to the results of alternative experimental procedures of seasonal adjustment; Section 7 shortly conclude

2. Dealing with missing countries

Possible estimation methods to deal with the problem of missing member states are:

1. temporal disaggregation techniques, mainly used in areas where the same data are available at different frequencies, for example national accounts and unemployment;

2. use of univariate one step ahead forecast for each of the missing countries (usually ARIMA forecasts);

3. calculation of the average evolution of the available countries and imputation of such average evolution to each missing member state for the last period.

Clearly, the first approach appears to be the most robust one even if it can be criticised because the specification of the model is very rigid, and moreover all outliers and abnormal effects in the indicators directly affect the estimated aggregates.

The second approach is also acceptable when there is a stable economic situation, but it fails when the series is characterised by a strong volatility, for example in the proximity of turning points. This approach is used in the context of the calculation of HICP.

The last approach, currently used in short-term business statistics, could be considered as the most arbitrary and unsatisfactory one due to the implicit assumption that all the economies evolve in a similar way, which could fall short especially in periods of uncertainty. When this approach is chosen, particular attention should be given to his validation, for example by comparing the evolution of each specific missing country with the average of available ones for the most recent period back in time.

More sophisticated estimation methods for missing countries could be used, in particular multivariate procedures based on time series models or on (dynamic) regression ones, using information coming from other sources such as business and consumer surveys information, or relevant related national indicators. Alternatively, it is possible to construct a regression model of all available countries on the total till the last available period and use it to estimate the total for the current period. This model will be equivalent to the third approach mentioned above only under the unlikely hypothesis that the regression coefficient is equal to one and no autocorrelation term is present.

Finally, it must be noted that the first approach discussed above does not lead to any estimation of the individual missing countries, whereas the second and the third ones generate such estimates

3. Seasonal adjustment of European aggregates

The seasonal adjustment of European aggregates can be performed following five alternative strategies:

I. Direct approach.

European aggregates are directly adjusted for calendar and seasonally effects, using either the program X-12 developed by the U.S. Census Bureau (see also Findley at al., 1998) or Tramo-Seats by Gomez and Maravall (1997), i.e. the two seasonal adjustment tools recommended by the ESS guidelines on seasonal adjustment by Eurostat (2009);

II. Direct seasonal adjustment based on national calendar adjusted data.

In this case a European total adjusted by calendar effect is built up from national calendar adjusted data and seasonal adjustment is then performed on this total by using either X-12 Tramo-Seats;

III. Direct approach complemented by benchmarking techniques.

As in I or II, complemented by benchmarking techniques to ensure the consistency between European and national seasonal adjusted figures;

IV. Centralised indirect adjustment.

Given a European aggregate, its seasonally adjusted version is obtained by aggregating the seasonally and calendar adjusted national components by using the same approach, namely either X-12 or Tramo-Seats;

V. Decentralised indirect seasonal adjustment.

Given a European aggregate, its seasonally adjusted version is derived by aggregating national and calendar seasonally adjusted data provided by member states.

The first two approaches can be preferred for transparency reasons because they allow a proper identification of each component of a time series. They can be used also when some countries are missing and replaced by one of the estimation strategy proposed in section 2. The main drawback of those approaches is that they do not ensure any consistency between national seasonally and calendar adjusted data and the corresponding European aggregates. Those approaches are particularly appropriated when the seasonal and not seasonal pattern of all (or almost all) member states components have similar characteristics.

Approach III is meant to avoid the drawback of I and II, but unfortunately it is feasible if and only if Eurostat is allowed to produce seasonally adjusted data also for member states, which only happens for external trade and monthly unemployment. Approach IV is appropriate mainly when seasonal factors? of national components can be substantially different. Another advantage of the centralised indirect seasonal and calendar adjustment is that there is a full consistency between European aggregates and national components, but this becomes a real advantage only in the few cases mentioned above when Eurostat is entitled to produce national seasonally adjusted data.

The main drawback of this approach is that if used when there are significant covariances between member states seasonal components, it is unable to detect those effects so that the European aggregates can be characterised by a residual seasonality. The approach V always ensures the consistency between the national and the European figures, but in case of lack of harmonisation at national level on the seasonal adjustment practice, the overall quality of European aggregates can be quite poor and characterised by residual seasonal and calendar effects.

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4. ESS guidelines suggestions

The problem of the seasonal adjustment of European aggregates is treated in section 2.3.1 of the ESS guidelines on seasonal adjustment. The following alternatives are proposed:

A. The direct approach is recommended for transparency reasons, under the condition that geographical component series show similar seasonal patterns and in case of a lack of harmonisation in the use of national approaches. The centralized indirect approach is recommended for special cases where it has been agreed that seasonal adjustment should be delegated to the centralised agency. The decentralized indirect approach can also be considered in the presence of a satisfactory degree of harmonisation of national seasonal adjustment practices and if components series show seasonal patterns differing in significant ways;

B. In the presence of strong users' requirements of consistency (i.e. additivity) between European aggregates and national ones, the decentralized indirect approach in presence of a satisfactory degree of harmonisation of national seasonal adjustment practices can be also accepted even when national series show similar seasonal patterns. However, indirectly adjusted European aggregates should be checked for the presence of residual seasonality.

C. The use of the mixed indirect approach.

In the present situation at Eurostat, the approach I is used in the quarterly sectoral accounts; the II in short-term business statistics and for the labour cost index; the approach IV for external trade and monthly unemployment and the approach V for quarterly national accounts. It is important to note that I, II and III can be used also in the presence of missing countries, whereas IV and V theoretically require the availability of all member states. To overcome this problem, it is possible in the IV strategy to forecast the non-seasonally adjusted member states and then to perform the seasonal adjustment, and for the strategy V to use grossing up or temporal disaggregation techniques to derive the European seasonally and calendar adjusted data from an indicator obtained by aggregating all available seasonally adjusted data provided by member states.

5. Empirical analysis

From the second half of 2008, due to the crisis, seasonal adjustment of most relevant short term statistics has become a crucial issue. The difficulties that seasonal adjustment presents under normal circumstances have been largely emphasized in the last periods for the sharp downturn and upturn movements observed in all the most relevant business short term indicators in Europe, as well as worldwide. Looking in particular at the recent evolution of the monthly industrial production index (IPI) in the euro area, see Figure 1, we have an important example of the impact of the crisis. Here it is presented the EA16 seasonal adjusted industrial production index 2005=100 released last April the 14th from Eurostat for the total industry excluding construction.

Seasonal adjustment of IPI European aggregates is carried out by Eurostat adopting Tramo- Seats through a direct strategy based on national calendar adjusted data. In terms of the classification presented in section 3 the approach II is used with the need to perform in a preliminary stage an estimate for the last period of calendar adjusted European aggregates. Missing countries are obtained through imputation of the annual growth rate of available countries.

The IPI has been recently subject to a twofold criticism: (1) the stability of the seasonal adjusted procedure across releases; (2) the consistency of European aggregates with respect to national data.

To show the first problem occurred to the EA16 IPI, we present in Table 1 the growth rates of the index in the months from February 2009 to February 2010, comparing the data of the last three releases, those of last February, March and April. The upper part of the table is devoted to annual growth rates of calendar adjusted data, whereas the lower to the monthly variations of the corresponding seasonal and calendar adjusted aggregates.

Figure 1: **EA16 seasonal adjusted industrial production index 2005=100**

Source: Authors' calculations

First evidence from the calendar adjusted data presented in the upper part of Table 1 is that the EA16 IPI is substantially stable across releases, apart from the end of the period. A consistent revision is recorded in the release of March for the data of December 2009: here the annual growth rates became -4.1% from -5% released in February; further, in April, the revision concerned the data of January 2010, whose annual growth rate became +1% from +1.4% released in March.

Focusing on the seasonal and calendar adjusted figures, lower part of Table 1, it is clear that a relevant revision occurred in March: here, all the monthly growth rates are substantially different from those released in February because of the change in the model specification underlying the procedure of seasonal adjustment. By contrast, the April's release is very similar to that of March.

Table 1: **Growth rates of EA16 IPI for total industry excluding construction in last months**

	Feb '09	Mar '09	Apr '09	May '09	Jun '09	Jul '09	Aug '09	Sep '09	Oct '09	Nov '09	Dec '09	Jan '10	Feb '10
Annual variations of calendar adjusted data													
February's release	-19.3	-19.4	-21.4	-17.8	-16.7	-15.8	-15.1	-12.7	-11.0	-6.9	-5.0	-	-
March's release	-19.3	-19.4	-21.4	-17.8	-16.7	-15.9	-15.1	-12.8	-11.1	-6.8	-4.1	1.4	-
April's release	-19.3	-19.6	-21.5	-18.0	-16.9	-15.9	-15.1	-12.8	-11.2	-7.0	-3.9	1.0	4.1
Monthly variations of seasonally and calendar adjusted data													
February's release	-3.9	-0.7	-0.6	0.9	1.0	0.1	1.1	0.2	-0.7	1.3	-1.6	-	-
March's release	-1.9	-1.3	-0.9	-0.4	0.2	0.2	0.4	0.7	0.3	1.2	0.5	1.7	-
April's release	-2.2	-1.2	-0.9	-0.5	0.3	0.3	0.4	0.7	0.3	1.3	0.8	1.6	0.9

Source: Authors' calculations

The second criticism concerned the lack of consistency of EA16 IPI aggregates with respect to national data, which has been particularly relevant for the data of February 2010. Table 2 presents the weights and the February 2010 monthly growth rates of seasonal adjusted IPI in the 7 largest member states and the EA16 released last April. First, note that the data for Belgium and Austria are not available in February 2010; then, that in February 2010 the monthly growth rate resulting aggregating the data of the other 5 available countries would give -0.1% against the variation released by Eurostat equal to +0.9%; further that the aggregate with 5 countries including Germany, France, Italy, Spain and The Netherlands covers the 83.5% of EA16 and that with 12 countries out of 16 comprised in EA16 would give the same monthly growth rate of -0.1% in February 2010.

Table 2: **Weights and February 2010 monthly growth rates of seasonal adjusted IPI in the 7 largest member states and EA16**

	Germany	France	Italy	Spain	Belgium	The Netherlands	Austria	EA16
Weights in %	34.6	16.9	17.0	10.1	3.9	4.9	3.4	100.0
February 2010 growth rates	-0.1	0.0	0.0	-0.1	-	-2.3	-	+0.9

Source: Authors' calculations

The lack of consistence among the European aggregates and country indices is one of the most relevant drawbacks of the direct approach to seasonal adjustment as stressed in section

3. However, under normal circumstances the differences between the direct and the indirect methods should be reasonable small and, preferably, without discordances in the sign of growth rates. But it is clear that under the sharp movements of the recent recession and current recovery, seasonal adjustment of IPI becomes very changeling. In particular the choice of the method, Tramo-Seats or X12, and the statistical treatment of outliers could strongly affect the final estimate of seasonal adjusted figures.

A further element of inconsistency could also depend on how missing data at the end of the sample period are treated. The problem is not irrelevant especially for Belgium and Austria, whose relative weight is respectively 3.9% and 3.4% of the total of EA16, whereas those of the other two missing countries, i.e. Cyprus and Slovakia is respectively 0.1% and 0.6%.

6. Results of alternative experimental procedures of seasonal adjustment

In this section we present the results of some alternative experimental procedures of seasonal adjustment conducted either under Tramo-Seats[3] and X-12[4]. The EA16 IPI released last April is accompanied by an alternative seasonal adjusted index obtained using directly Tramo-Seats and two further experiments conducted under X-12. The two couple of indexes for the period January 2008-February 2010 are shown in Figure 2, panel (a) devoted to Tramo-Seats and panel (b) to X-12. Further, in Table 3 the monthly growth rates of the set of alternatives are presented for the period February 2009-February 2010.

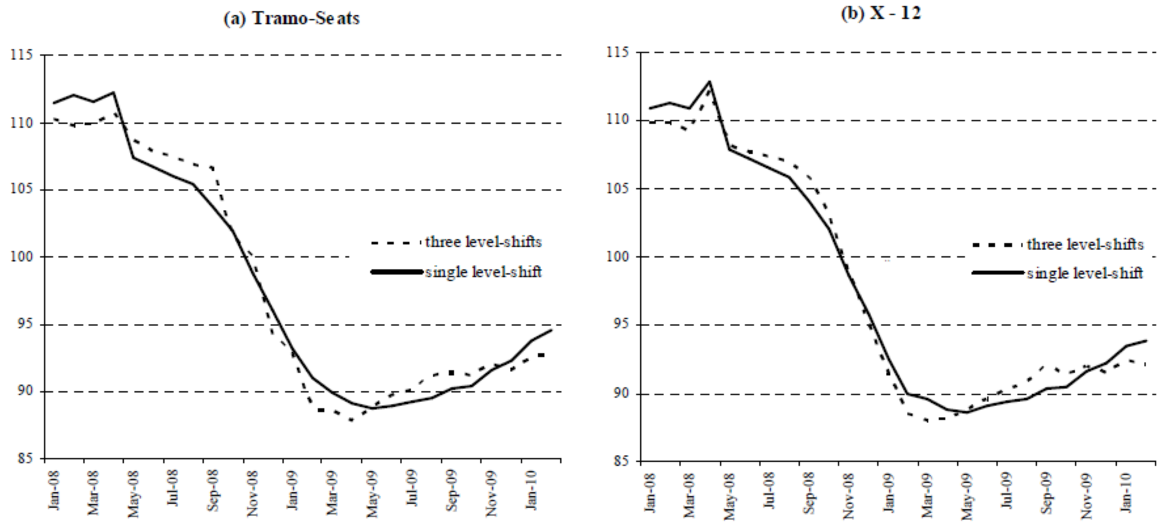
In a first experiment we have applied the old Tramo-Seats model specifications i.e. that adopted for the February 2010's release[5], to the more recent calendar adjusted EA16 IPI of last April. The specification is given by an ARIMA(1,1,1)(0,1,1) in logarithms and the treatment of outliers is carried out using three level-shift regressors, i.e. in October 2008, December 2008 and February 2009. Slightly different is the April's specification, given by an ARIMA(1,1,2)(0,1,1) in logs with the inclusion of a single level-shift in May 2008.

From figure 2 panel (a) it pops up the different pattern obtained under the first alternative seasonal adjustment strategy based on Tramo-Seats: here the series officially released by Eurostat in April in the period January 2008-February 2010 is in solid line and its alternative in dotted line. In order to stress the prominent role of the different treatment of outliers, the first series is labelled with 'single level-shift' and the latter with 'three level-shifts'. From the comparison it emerges the following: 1)under the single level-shift treatment the resulting pattern is smoother than its alternative with 'three level-shift'; 2)in this latter case the trough of mid 2009 is deeper than the former, appearing at the same time anticipated of one/two months.

Further, the most recent monthly growth rates resulting from the Tramo-Seats experiment are presented at first line of Table 3; in parenthesis are the differences in percentage points from the data released last February. Under this specification the monthly growth rate in February 2010 is equal to +0.2%, reasonably close to -0.1% resulting from simple aggregation of Member State data. Then, the resulting discrepancy is somewhat acceptable in this case considering that a direct approach to seasonal adjustment is adopted. Note also that, the differences in the other months are less than half percentage point in the months till November 2009 and 1.1 percentage point in December 2009. This last revision is explained from the change of calendar adjusted data (see Table 1), whereas all the others from the combination of all the revisions of the series and for the largest sample period taken into account in the experiment, which include also the two final observations of January and February 2010.

[3] In most of the calculations we have used the program Demetra in the version 2.2 released by Eurostat (2008).
[4] Most calculations have been conducted using X-12 seasonal adjustment with regARIMA for OxMetrics, version 2.09, Release Version 0.2. For documentation see Doornik (2007) for OxMetrics and U.S. Census Bureau (2010) for X-12.
[5] We thank Sven Kaumanns from Eurostat unit G.3, who has kindly provided to us the model specification.

Figure 2: **The resulting seasonal adjusted EA16 IPI under Tramo-Seats and X-12: comparison between two alternative treatments of outliers**



Source: Authors' calculations

The other two experiments of direct seasonal adjustment under X-12 have been conducted similarly to Tramo-Seats i.e. including, first, the same 3 level-shifts considered in the February's release and, second, the single level-shift of the March and April' specifications. Figure 2 panel (b) shows the couple of resulting figures at the end of the sample. From a first comparison among the two X-12 alternatives it emerges the same role played from the treatment of outliers as Tramo-Seats and the related interpretation. Moreover, from a cross glance of panels (a) and (b) of Figure 2 it is also evident how similar are the seasonal adjusted series under X-12 and Tramo-Seats when the treatment of outliers is carried out with a single level-shift (solid line) or three level-shifts (dotted line) respectively.

Table 3: **Monthly growth rates of EA16 IPI: results of alternative seasonal adjustment procedures**

	Feb '09	Mar '09	Apr '09	May '09	Jun '09	Jul '09	Aug '09	Sep '09	Oct '09	Nov '09	Dec '09	Jan '10	Feb '10
TS: 3 lev.	-4.3	-0.3	-0.7	1.1	1.1	0.4	1.2	0.3	-0.2	0.9	-0.5	1.1	0.2
shifts-	*(-0.5)*	*(0.4)*	*(-0.2)*	*(0.2)*	*(0.0)*	*(0.3)*	*(0.0)*	*(0.0)*	*(0.5)*	*(-0.4)*	*(1.1)*	-	-
X-12: 3	-3.2	-0.5	0.1	0.8	0.9	0.7	0.7	1.3	-0.7	0.7	-0.5	0.9	-0.2
lev. shifts	*(0.6)*	*(0.2)*	*(0.7)*	*(-0.1)*	*(-0.2)*	*(0.6)*	*(-0.4)*	*(1.1)*	*(0.0)*	*(-0.6)*	*(1.1)*	-	-
X-12: 1	-2.7	-0.4	-0.9	-0.2	0.5	0.3	0.3	0.8	0.2	1.3	0.6	1.3	0.4
lev.	*(1.2)*	*(0.2)*	*(-0.3)*	*(-1.1)*	*(-0.5)*	*(0.2)*	*(-0.8)*	*(0.6)*	*(0.8)*	*(-0.1)*	*(2.2)*	-	-

Source: Authors' calculations

The resulting monthly growth rates of the couple of X-12 experiments are presented at line two and three of Table 3 respectively, with in parenthesis the differences in percentage points from the growth rates of the February's release. The series obtained from the 3 level-shifts specification produces -0.2% in February 2010, even closer than Tramo-Seats to that resulting from aggregation of Member States data (-0.1%). In both the cases the recent evolution of the IPI traced from X-12 is different from Tramo-Seats, with lower differences when the specification includes the same set of outliers.

6.1 The impact of alternative estimates of missing countries at end of sample

The impact of alternative estimates of missing countries on the final seasonal adjusted figures of the euro area IPI is here assessed considering a set of alternative one step ahead ARIMA forecasts for each of the missing countries. As discussed in previous sections we focus our attention on the forecasts for February 2010.

In Table 4 we present the results of a simple forecast experiment on calendar adjusted data for the 4 missing countries, Belgium, Austria, Cyprus and Slovakia and the EA16 aggregate. In the upper part of the table we show the annual growth rates of the alternative one step ahead forecasts for February 2010 at country as well as at EA16 level. These latter variations result from aggregation of missing country estimates with available data of the remaining 12 countries. In the lower part of the table the monthly growth rates of the seasonal adjusted alternatives for EA16 are also presented.

The forecasts have been obtained from three alternative model strategies: first, an automatic ARIMA model selection performed by Tramo-Seats; then, for uniformity with the previous discussion, the standard Airline specification in logs, including from one side the usual 3 level-shift regressors (October 2008, December 2008 and December 2009) and from the other a single regressor (May 2008). In all the automatic specifications the model has been fitted to the logs of the series; for euro area data the selected model has been an ARIMA(3,1,0)(0,1,1) with a single level-shift in May 2008, whereas that of the official release is an ARIMA(1,1,2)(0,1,1) in logs with identical level-shift.

The steps of the procedure are the following: (a) fitting the specified model to calendar adjusted data of the four missing countries; (b) computing the one step ahead forecasts in the original levels of the series for February 2010; (c) aggregating the results in order to obtain the alternative EA16 calendar adjusted indexes till February 2010; (d) proceed with direct seasonal adjustment of this latter aggregate using the same model specification.

What emerges from the results of Table 4 is that for the EA16 IPI the alternative estimates for February 2010 are always lower than the official release: in terms of calendar adjusted data, the annual growth rates of our experiments reduce from 0.2 to 0.4 percentage points with respect to the official release; in terms of seasonal adjusted data, the negative impact is particularly strong, -1.3 percentage points, under the specification with 3 level-shifts and lower under the automatic model strategy.

Table 4: Alternative IPI forecasts for February 2010: missing countries and EA16

	Official release(1)	Automatic(2)	Airline with 3 level-shifts(3)	Airline with 1 level-shifts(4)
	annual growth rates of calendar adjusted data			
Belgium	-	+1.6%	+2.2%	-4.4%
Austria	-	+0.8%	-0.9%	+0.3%
Cyprus	-	-3.0%	-3.5%	-4.2%
Slovakia	-	+17.1%	+11.7%	+21.1%
EA16	**+4.1%**	**+3.9%**	**+3.8%**	**+3.7%**
	monthly growth rates of seasonal adjusted data under Tramo-Seats			
EA16	**+0.9%**	**+0.7%**	**-0.4%**	**+0.1%**

Source: Authors' calculations

Note: (1)the ARIMA(1,1,2)(0,1,1) specification in logs with a level shift in May 2008 is used for seasonal adjustment of the EA16 IPI only; (2)ARIMA(3,1,0)(0,1,1) in logs with a level shift in May 2008 for the EA16 IPI; (3)model in logs with 3 level-shifts in October and December 2008 and February 2009; (4)model in logs with 1 level-shift in May 2008.

The main conclusion of this simple forecasting exercise on the euro area IPI is that seasonal adjustment could strongly affects the signal delivered to users and, under the recent crises, the treatment of outliers is crucial, with a stronger impact with respect to the treatment of missing countries.

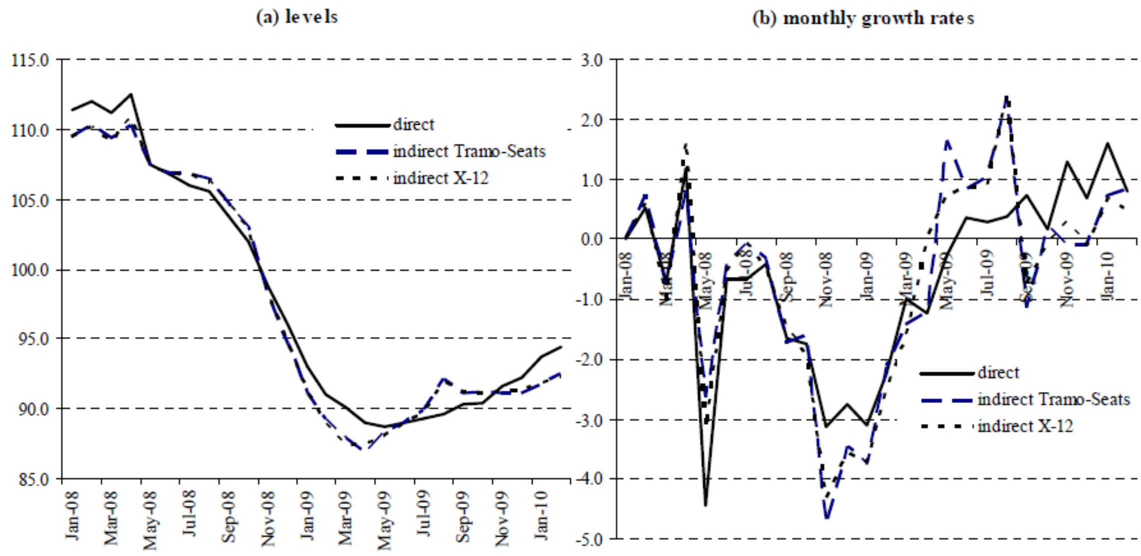
6.2 Results of a preliminary implementation of an indirect strategy

In this section we present the results of a preliminary experiment of an indirect strategy to seasonal adjustment on the EA16 IPI. These experiments have been conducted under both Tramo-Seats and X-12 using, in prevalence, the features of the automatic model specification of the new prototype program Demetra+ developed by the Statistics Department of the National Bank of Belgium.

The indirect strategy to seasonal adjustment followed here is organized as follows: (a)preliminary one step ahead ARIMA forecasts of missing values. The automatic model selection features of Demetra+ have been applied; (b)automatic model specification for each country. For X-12 this step concerns the outlier detection only; (c)computing seasonal adjusted country figures; (d)aggregating the 16 indexes.

In Figure 3 is shown the comparison of the alternative indexes resulting from the two indirect strategies under Tramo-Seats and X-12 and the direct strategy to seasonal adjustment under Tramo-Seats. In panel (a) the levels of the 3 indexes are presented in the period January 2008- February 2010, whereas in panel (b) the same indexes are shown in terms of monthly growth rates.

Figure 3: **The EA16 seasonal adjusted IPI: comparison between the direct and the indirect approach**



Source: Authors' calculations

From both the panels of Figure 4 emerges that both the indirect strategies appears similar each other, but diverge from the direct automatic approach. In particular, under the direct strategy the sharp downturn and the moderate recovery show a more gradual profile than both the indirect strategies and that the through of mid 2009 is shifted two months ahead in the case of direct adjustment. However, the growth rate in February 2010 is +0.9% under the indirect Tramo-Seats approach, the same as that officially released from Eurostat, whereas it is +0.5% under X-12. Finally, it is clear the closeness of the pattern of both the indirect approaches with the direct approach with 3 level-shifts discussed in previous section.

The results of this comparison are by no means conclusive, as they refer to a particular case study. They nevertheless suggest that the use of Tramo-Seats or X-12 under an indirect approach doesn't affect significantly final seasonal adjusted estimates. Moreover, even if it appears more complicate for the need to seasonal adjust a set of 16 time series, the automatic implementation presents the advantage to be easy to implement, assuring time consistency with member state data and reducing the dependence of final seasonal adjusted estimates from the strategy adopted for the treatment of outliers.

7. Conclusions

The paper has discussed the crucial problems related to seasonal adjustment of euro area short term statistics and challenges created from the latest economic recession. The focus went on the implications of the availability of member states data at the end of the sample and the alternative strategies to derive the aggregate index. In this context the recommendations of the ESS Guidelines on seasonal adjustment has been also recalled.

A simulation approach based on the industrial production has been implemented with the aim to compare the results of alternative treatments of outliers under both Tramo-Seats and X-12. Simple estimation strategies for missing countries at the end of the sample have been proposed measuring the impact on the final seasonal adjusted estimates. The use of an indirect strategy to seasonal adjustment of the euro area aggregate has also been assessed through a simple experiment based, in prevalence, on an automatic model specification. What the empirical analysis suggests is that due to the recent crisis the choices regarding seasonal adjustment and especially the treatment of outliers could affect significantly the message delivered to policy makers.

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How seasonal adjustment can affect the message delivered to policy makers

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This paper shows how the choice of alternative methods for seasonal djustment and for the estimation of missing countries can significantly affect the message delivered to the users of statistics and especially policy makers and media.

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