ISSN 2315-0815

eurostat
Manuals and guidelines

ESS guidelines on seasonal adjustment

2015 edition

eurostat

eurostat
Manuals and guidelines

ESS guidelines on seasonal adjustment

2015 edition

eurostat

Europe Direct is a service to help you find answers
to your questions about the European Union.

Freephone number (*):

00 800 6 7 8 9 10 11

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

More information on the European Union is available on the Internet (http://europa.eu).

Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2015

ISBN 978-92-79-45176-8
ISSN 2315-0815
doi:10.2785/317290
Cat. No: KS-GQ-15-001-EN-N

Theme 1: General and regional statistics
Collection: Manuals and guidelines

Foreword

The establishment of common guidelines for seasonal adjustment (SA) within the European Statistical System (ESS) is an essential step towards a better harmonisation and comparability of infra-annual statistics, especially Principal European Economic Indicators (PEEIs).

The ESS Guidelines on Seasonal Adjustment address the need for harmonisation expressed on several occasions by many users such as the European Central Bank (ECB), European Commission services, and the ECOFIN Council.

The definition of best practices in the field of seasonal adjustment has been long debated at European level. Since 2007, the Seasonal Adjustment Steering Group co-chaired by Eurostat and the ECB gave a new and crucial input to the compilation of the first edition of the guidelines, published in 2009. The first edition has been widely accepted and implemented. However, taking into account the experience accumulated since 2009 and the need to further clarify some specific aspects, in 2012 the Seasonal Adjustment Steering Group decided to launch a revision of the guidelines. The ESS Guidelines on Seasonal Adjustment are the outcome of the revision work and the ESS Committee (ESSC) endorsed them in November 2014.

The revised ESS Guidelines on Seasonal Adjustment present both theoretical aspects and practical implementation issues in a friendly and easy to read framework, thereby addressing both experts and non-experts in seasonal adjustment. They meet the requirement of principle 7 (Sound Methodology) of the European Statistics Code of Practice and their implementation will also be in line with principles 14 (Coherence and Comparability) and 15 (Accessibility and Clarity).

The guidelines also foster the transparency of seasonal adjustment practices by encouraging the documentation of all seasonal adjustment steps and the dissemination of seasonal adjustment practices by means of the metadata template for seasonal adjustment. Finally they allow for development of expertise and capacity building.

The revised version of the guidelines includes a new section with a policy for seasonal adjustment, making the revised version of the guidelines consistent with the guidelines on revisions policies. It also better describes the different steps in seasonal adjustment. Finally the specification of alternatives has been reviewed, making them more operational.

This major achievement has been possible thanks to the commitment of a wide range of well-known experts on seasonal adjustment.

Mariana KOTZEVA
Director
Methodology, Corporate statistical and IT services

Silke STAPEL-WEBER
Director
National accounts, prices and key indicators

Acknowledgments

The European Commission expresses its gratitude and appreciation for the work carried out by the authors of the ESS guidelines on seasonal adjustment: Mark Boxall (ECB), Gary Brown (ONS), Dario Buono (Eurostat), Duncan Elliot (ONS), Robert Kirchner (Bundesbank), Dominique Ladiray (INSEE), Gian Luigi Mazzi (Eurostat), and Rosa Ruggeri Cannata (Eurostat).

The European Commission would like to thank the chairs of the Seasonal Adjustment Steering Group, Roberto Barcellan and Tjeerd Jellema, together with all members for their useful comments and support.

The European Commission would also like to thank all the seasonal adjustment experts from Eurostat, from National Statistical Institutes, from the ECB and from National Central Banks who have contributed with their comments to improve the Guidelines.

Table of contents

Introduction

Motivation for guidelines

The European Statistical System (ESS) developed these guidelines to promote best practice in seasonal adjustment to:

- achieve harmonisation across national processes;
- enhance comparability between results;
- increase robustness of European aggregates.

The guidelines are aimed at all infra-annual statistics produced by the ESS which are politically and/or economically important.
The guidelines provide a consistent framework for seasonal adjustment, taking advantage of similarities in the process to define a common vocabulary to facilitate communication and comparison between practitioners.
A standard metadata template would improve user understanding of seasonal adjustment by providing transparency in revisions policies, modelling options chosen, and reliability of outputs. Such metadata template will be developed after the endorsement of the guidelines.

Scope of guidelines

The guidelines are aimed at anyone whose work involves seasonal adjustment. Both for experts and others, the framework for seasonal adjustment remains the same: only the level of detail in the analysis varies.
The guidelines cover issues related to seasonal adjustment of monthly or quarterly time series, from pre-treatment, through seasonal adjustment, to revisions, quality measurement, documentation and publication.
Each stage of the seasonal adjustment process is detailed and options described. Out of these options three alternative courses of action are highlighted: (A) Best alternative (B) Acceptable (C) To be avoided.

(A) The best alternative should always be the feasible target for producers. It should always be achievable with a reasonable effort, unless some production or institutional constraints prevent it.
(B) The acceptable alternative should be used as an intermediate step towards the achievement of alternative A. It could also be seen as the target for a limited number of cases when specific data issues, user requests, time or resource constraints, prevent the achievement alternative (A).
(C) The alternative to be avoided is not recommended.

The objective of the guidelines is help producers move to alternative (A). Careful considerations and, possibly, prompt measures should be taken whenever alternative C is in use.

Costs and risks

The costs of applying the guidelines' recommendations are considerable as seasonal adjustment is time consuming in terms of human resources and requires a common and well defined IT structure.

The risks of not applying the guidelines' recommendations are that inappropriate or low-quality seasonal adjustment can generate misleading results, for example over-smoothing or residual seasonality, increasing the probability of false signals leading to misinterpretation of seasonally adjusted data. This will reduce credibility and hence, ultimately, trust in statistics.

Background to guidelines and basic definitions

Seasonal adjustment is a fundamental process in the interpretation of time series to inform policy making.

Seasonal fluctuations and calendar effects can mask short and long-term movements in a time series and impede a clear understanding of underlying phenomena. Seasonal adjustment filters out usual seasonal fluctuations and typical calendar effects from a time series.

- Usual seasonal fluctuations mean those movements which recur with similar intensity in the same season each year and which, on the basis of the past movements of the time series in question and under normal circumstances, can be expected to recur.
- Calendar effects arise from annual differences in the number of working or trading days in a month or a quarter, or the dates or days of public holidays.

Movements due to exceptionally strong or weak seasonal influences, for example extreme weather conditions or atypical holiday patterns, will continue to be visible in the seasonally adjusted series. Other random disruptions and unusual movements with real-world interpretations, for example strikes or large orders, will also continue to be visible.

Hence, the seasonally adjusted results do not show “normal” and repeating events, but do show the “news” in the time series, for example turning points in the trend, the business cycle or the irregular component.

The downside of seasonal adjustment is that seasonality cannot be precisely defined and different approaches – such as the signal extraction approach (Burman, 1980; Gomez and Maravall, 1996) and the semi-parametric approach based on a set of predefined moving averages (Shiskin et al, 1967; Findley et al, 1998) – may result in different outcomes. The expertise of an analyst will also impact on the quality of seasonal adjustment, although the primary drivers are the quality of the unadjusted time series and the production timetable: in a mass production environment, when thousands of time series are seasonally adjusted in a short period of time, often only alternative (B) can be achieved, although alternative (A) may still be possible for some. These guidelines are designed to guide producers through this process, to achieve a more comparable end result.

Annex: Principles for seasonal adjustment

1. The objectives of seasonal adjustment are to identify and remove seasonal fluctuations and calendar effects which can mask short and long-term movements in a time series and impede a clear understanding of underlying phenomena. Seasonal adjustment is therefore a fundamental process in the interpretation of time series to inform policy making.
2. As seasonal adjustment is performed both at European and Member States levels in several domains, it is important to ensure consistency between different seasonal adjustment policies. A general ESS set of principles must be defined and published.
3. Seasonal adjustment policies compliant with the principles must be defined at Member States and domain levels, taking care of inter-domain constraints, and published. These policies must be as stable over time as possible.
4. To avoid misleading results, seasonal adjustment should be applied only when seasonal and/or calendar effects can be properly explained, identified and estimated. Where none of these effects can be identified and estimated, unadjusted and calendar/seasonally adjusted series are identical.
5. The use of regARIMA models is recommended to estimate and remove outliers before estimating the seasonal effect.
6. It is also recommended to use regARIMA modelling to calculate calendar adjustment factors. These calendar adjustment factors should take into account the different characteristics of national calendars.
7. Seasonally adjusted series should have neither residual seasonality nor residual calendar effects and should show both the full trend-cycle and irregular component.
8. The quality of seasonally adjusted data must be regularly checked. The results of this monitoring should be made available to the public.
9. A stable and publicly available revision policy for seasonally adjusted data must be defined and followed.
10. Seasonally adjusted data should be published with unadjusted data according to an announced release calendar.
11. The recommended seasonal adjustment methods are parametric methods based on signal extraction like Seats (Gomez and Maravall, 1996) and semi-parametric methods based on a set of predefined moving averages like Census II X 11 family (Findley et al., 1998) and X-13ARIMA-SEATS.

1. A policy for seasonal adjustment

1.1. A general seasonal adjustment policy

Description

Seasonal adjustment is performed both at European and Member State level in several domains. It is important to define a general seasonal adjustment policy based on a set of principles.

A general policy for seasonal adjustment describes which issues (not depending on data characteristics) should be decided in a consistent way when performing seasonal adjustment in different domains and/or institutions. It should include at least the need for consistency among different seasonal adjustment policies, when and on the basis of which methods to perform seasonal adjustment, the need for assessment of the seasonally adjusted data quality, the existence of a stable and publicly available revision policy for seasonally adjusted data, the need for dissemination of metadata on the seasonal adjustment process in a ESS standardised format.

Options

— A general seasonal adjustment policy is adopted in line with the principles for seasonal adjustment, including at least when and on the base of which methods to perform seasonal adjustment, the need for assessment of the seasonally adjusted data quality, the existence of a stable and publicly available revision policy for seasonally adjusted data, and the need for dissemination of metadata on the seasonal adjustment process.

— A general seasonal adjustment policy in line with the principles for seasonal adjustment is adopted; however exceptions are performed based on justified needs. Exceptions are documented and efforts are undertaken in order to reduce their impact and their occurrence. The trade-off between harmonisation and particular needs is carefully considered, guaranteeing the maximum possible degree of harmonisation.

— Lack of a general seasonal adjustment policy.

Alternatives (*)

A) Adopt a general seasonal adjustment policy fully compliant with the principles for seasonal adjustment, specifying at least when and on the base of which methods to perform seasonal adjustment, the need for assessment of the seasonally adjusted data quality, the existence of a stable and publicly available revision policy for seasonally adjusted data, the need for dissemination of metadata on the seasonal adjustment process.

B) Adopt a seasonally adjustment policy only partially compliant with the principles for seasonal adjustment; exceptions to the general principles are limited to when they are considered unavoidable; those exceptions are documented and efforts are undertaken in order to reduce their impact and their occurrence.

C) No seasonal adjustment policy is adopted, or adoption of a seasonal adjustment policy not compliant with the seasonal adjustment principles.

(*) A) Best alternative; B) Acceptable; C) To be avoided

1.2. The need for domain specific seasonal adjustment policies

Description

Statistical producers and users are confronted with very varied production processes and data sources; even in the presence of related concepts, the production processes can differ to the degree of requiring some effort to get a comparable and consistent national or European system of statistics. Each statistical domain can be characterised by specific data/survey characteristics as well as by constraints derived from existing legal acts.

Statistical institutions should adopt harmonised domain specific seasonal adjustment policies. A domain specific seasonal adjustment policy will address the issues related to data characteristics or to the specific data production process of the domain that need to be harmonised in order to guarantee data comparability at ESS level. For example, in National Accounts a domain specific seasonal adjustment policy should define the strategy for dealing with the seasonal adjustment of volumes data expressed in chain-linked form.

Domain specific seasonal adjustment policies must be compliant with the general seasonal adjustment policy and harmonised at ESS level.

Options

- Adopt domain specific seasonal adjustment policies compliant with the general seasonal adjustment policy and harmonised at ESS level.
- Adopt domain specific seasonal adjustment policies taking into account the general seasonal adjustment policy, but with some well justified exceptions; constant effort to reduce discrepancies and to move towards harmonisation of policies is performed and monitored.
- Adopt domain specific seasonal adjustment policies not harmonised at ESS level.
- Do not adopt any domain specific seasonal adjustment policy.

Alternatives (*)

A) Adopt domain specific seasonal adjustment policies fully compliant with the general seasonal adjustment one and harmonised at ESS level.

B) Adopt domain specific seasonal adjustment policies only partially compliant with the general seasonal adjustment policy or not harmonised at ESS level. Reasons for the lack of compliance and/or harmonisation should be clearly justified.

C) Lack of domain specific seasonal adjustment policies, or domain specific seasonal adjustment policies not compliant with the general seasonal adjustment policy, or not harmonised at ESS level.

(*) A) Best alternative; B) Acceptable; C) To be avoided

1.3. Consistency of general and domain specific policies

Description

When looking at consistency several aspects have to be considered; consistency of domain specific seasonal adjustment policies across institutions and with the general policy has been considered in the previous item; however, we have also to consider the cross domain consistency. When looking at domain level, it could be relevant for the user to compare different statistics stemming from related domains, for example for base statistics and derived ones, in order to assess the degree of comparability between them; this aspect is related to the quality assessment of a system of statistics. It is then necessary that statistical institutions adopt domain specific seasonal adjustment policies consistent across domains, taking into account the implications that domain specific seasonal adjustment policies have on other domains at national and European level.

Options

- Adopt domain specific seasonal adjustment policies consistent across domains in order to ensure the comparability of final results with data stemming from related domains and the harmonisation of practices at national and ESS level.
- Adopt domain specific seasonal adjustment taking account of consistency across domains, but with some well justified exceptions; constant effort to reduce discrepancies and to move towards harmonisation of practices with other domains is performed and monitored.
- Adopt domain specific seasonal adjustment policies not coordinated with other domains.
- Adopt domain specific seasonal adjustment only partially consistent across domains.

Alternatives (*)

A) Adopt domain specific seasonal adjustment policies consistent across domains at national and ESS level.

B) Adopt domain specific seasonal adjustment policies, only partially consistent across domains. Reasons for the lack of full consistency should be clearly justified; constant effort to reduce discrepancies and to move towards harmonisation of practices with other domains is performed and monitored.

C) Adoption of domain specific seasonal adjustment policies not consistent across domains.

(*) A) Best alternative; B) Acceptable; C) To be avoided

1.4. Stability of seasonal adjustment policies

Description

Maintaining the stability of the general and domain specific seasonal adjustment policies over time is important to foster user confidence and ensure transparency of the seasonal adjustment process. The general policies for seasonal adjustment should rarely be revised; when this happens, domain specific seasonal adjustment policies should be reviewed accordingly.

At domain level and when looking at the data production side, the stability of a domain specific seasonal adjustment policy is an essential element of a well-established production process which will allow for better planning of activities and resources. When looking at the user side, the stability of a domain specific seasonal adjustment policy ensures that users generally know in advance when, which and why seasonally adjusted data will be revised. However, it could be necessary to change domain specific seasonal adjustment policies in order to keep them in line with relevant improvements in the production process. This could be the case when changes could enhance accuracy and/or reduce the statistical burden or be necessary to fulfil national laws.

When a seasonal adjustment policy needs to be changed, it is better to adopt the new policy in correspondence with major seasonal adjustment revision. Changes in seasonal adjustment policies should be communicated in advance, well documented and justified and should be, as far as possible, coordinated at ESS level.

Options

— The general seasonal adjustment policy and the domain specific seasonal adjustment ones are stable over time. If changes occur, they are announced in advance and coordinated as far as possible at ESS level.

— Domain specific seasonal adjustment policies are validated from year to year and eventually revised.

— Changes in the general seasonal adjustment policy or in the domain specific seasonal adjustment ones happen often and/or irregularly in time.

Alternatives (*)

A) The general seasonal adjustment policy and the domain specific ones are stable over time; when changes are required (new legal acts, new definitions, new methods of estimation, etc.), they should be coordinated as far as possible at ESS level and announced in advance. Important changes of domain specific seasonal adjustment policies at the member state level that are necessary to foster accuracy, to reduce the reporting burden or to fulfil national laws should be preannounced too. Those cases should be combined as far as possible.

B) The general seasonal adjustment policy is stable over time at ESS level. Domain specific seasonal adjustment policies are validated annually, eventually revised and coordinated as far as possible at ESS level.

C) Lack of coordination/stability of general seasonal adjustment policy and/or domain specific seasonal adjustment ones.

(*) A) Best alternative; B) Acceptable; C) To be avoided

1.5. Dissemination of general and domain specific seasonal adjustment policies

Description

Seasonal adjustment is a very relevant process for the user; even if some aspects of seasonal adjustment may appear quite technical, it is important to inform the user about the adopted approach at least for the seasonal adjustment of main indicators. What can appear as a small change, e.g. the introduction of a new public holiday in the pre-treatment process, may have significant impact on results and on data treatment at user level. It is important to publish and keep updated the general and domain specific seasonal adjustment policies; they should be standardised at ESS level and made easily available, e.g. publishing them on the statistical agencies' websites.

Options

- The general seasonal adjustment policy and the domain specific seasonal adjustment ones are publicly available at least for main indicators. Users are promptly informed about any relevant change in the policies (e.g. new quality assessment criteria, new model revision criteria, etc.); documentation on the seasonal adjustment process is published in an ESS standard format, publicly available and kept up to date, focusing on the transparency of the process.
- The general seasonal adjustment policy and the domain specific seasonal adjustment ones are available in a non-standard format and/or only on request, even for main indicators; some information on the seasonal adjustment process is published but only on very general aspects.
- Information on the seasonal adjustment of main indicators is not disseminated, even on request.

Alternatives (*)

A) The general seasonal adjustment policy and the domain specific ones are publicly available in a ESS standardised format, promptly informing the user of any change.

B) The general seasonal adjustment policy and the domain specific ones are publicly available; efforts are performed to keep the information up to date in a reasonable delay.

C) The general principles for seasonal adjustment and the domain specific seasonal adjustment policies are available only on request or not available at all; changes are eventually communicated with long delay.

(*) A) Best alternative; B) Acceptable; C) To be avoided

1.6. Quality framework for seasonal adjustment

Description

Quality measurement of seasonal adjustment needs to consider all five ESS dimensions of statistical output quality, as listed in the European Statistics Code of Practice:

- relevance
- accuracy and reliability
- timeliness and punctuality
- coherence and compatibility
- accessibility and clarity

Measures can be qualitative or quantitative – qualitative measures will normally be "Yes" or "No", and quantitative measures will normally be test statistics with the direct interpretation of "Pass" or "Fail".
Relevance is measurable qualitatively through consultation with users, for example the perception of quality depends on users' satisfaction that the outputs meet their needs. This quality dimension is considered in section 5.
Accuracy and reliability are measurable quantitatively through statistical tests to assess whether the seasonally adjusted time series display suitable characteristics; the measures should not be limited by software choice. For example, if they are not embedded in the seasonal adjustment software, they should be defined elsewhere. These quality dimensions are considered in section 5.
Timeliness and punctuality are measurable quantitatively relative to publication timetables. For example, ,in the case of mass production of seasonally adjusted time series, run-times of processes may limit the number of quality measures that can be validated due to the sheer number of series involved. These quality dimensions are considered in section 7.2.
Coherence and comparability are measurable quantitatively through statistical tests: using measures within software packages to assess coherence over time/domain/across European member states; and using common measures to assess comparability over methods. These quality dimensions are considered in section 5.
Accessibility and clarity are measurable both quantitatively through enumeration of outputs and qualitatively through consultation with users and producers: accessibility in terms of what statistics are available; clarity in terms of user satisfaction with the interpretability of the final seasonally adjusted series, and producer satisfaction with the quality of the seasonal adjustment settings in production systems, for example in the case of concurrent adjustment where settings are reviewed annually by independent experts. These quality dimensions are considered in section 7.1.

Options

- Measure quality comprehensively for the qualitative/quantitative ESS dimensions of statistical output quality.
- Measure quality partially for the qualitative/quantitative ESS dimensions of statistical output quality.
- Measure quality for none of the qualitative/quantitative ESS dimensions of statistical output quality.

Alternatives (*)

A) Measure quality comprehensively for all the ESS dimensions of statistical output quality.
B) Measure quality comprehensively for the quantitative ESS dimensions of statistical output quality, and partially for the qualitative dimensions.
C) Measure quality partially (or not at all) for the quantitative ESS dimensions of statistical output quality, and/or not at all for the qualitative dimensions.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2. Pre-treatment

2.1. General aspects for choosing between detailed and automatic pre-treatment

Description

Most seasonal adjustment methods and software estimate the seasonal component using linear procedures and filters: ARIMA models, moving averages, regression analysis, state-space models, etc. These linear tools are optimal under certain assumptions but also have some weaknesses:

- They are not robust, i.e. they are sensitive to the presence of atypical values (outliers).
- They are sensitive to any misspecification of the underlying model.

The main objective of pre-treatment of the series is to ensure a reliable estimation of the seasonal and calendar component. This is done in particular by detecting and correcting the series for data and/or components, sometimes called “non-linearities”, which could hamper the estimation of the seasonality and the calendar effects.

Outliers are a clear example of data that could greatly affect the quality of the seasonal estimate.
Various kinds of outliers (i.e. additive outliers, transitory changes, level shifts etc.) should be detected and corrected for. RegARIMA models have proved a successful method of doing this.

Economic time series are usually recorded each month (or each quarter) but months (or quarters) are not equivalent. In particular, they have neither the same length nor the same composition in number of days. These details, strictly linked to the calendar, may affect the unadjusted data. For example, one more Saturday in a month may explain an increase in the retail trade turnover. RegARIMA models can also be used to detect and correct the series for these calendar effects (different number and structure of working or trading days in different periods, moving national or religious holidays). It should be noted that a part of these calendar effect is seasonal (the length of most months repeats itself every year, the non-Orthodox Easter falls more often in April than in March, etc.) and that the calendar component should only concern the non-seasonal part of the effect, whereas the seasonal part of the calendar influences should be assigned to the seasonal component. It is also important to note that the analyst has very few doubts about the future of the calendar which is periodical with a period of 400 years. (This does not apply to the date of Easter, but even this can be calculated with certainty in advance.) Therefore, an official calendar adjustment should include good estimates of the calendar effects, as these also will improve forecasts of the unadjusted data and lead to more stable estimates of the seasonal component.

Most of the statistical tools used in seasonal adjustment procedures rely, at least in one step of the adjustment, on the stationarity of the series. The stationarity in mean can usually be achieved by appropriate differencing. The stationarity in variance may require a further transformation of the series, specifically testing for log-transformation to guide the choice of the decomposition scheme (see item 2.10).

Options

- Running a detailed pre-treatment based on RegARIMA models using statistical criteria complemented by the use of economic and calendar information.
- Running an automatic pre-treatment based on selected statistical strategies only (unit root testing, information criteria, tests on statistical significance as mentioned in subsequent items, tests on the white-noise-property of the model residuals, using calendar regressors and outlier variables, etc.).
- Ignoring economic and statistical information (i.e. no pre-treatment of the series).

Alternatives (*)

A) A detailed non automatic pre-treatment at least once a year for the most important macroeconomic indicators based on RegARIMA models and the best alternatives mentioned in the items of this section.

B) Automatic pre-treatment.

C) No pre-treatment.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.2. Graphical analysis of the series

Description

A first graphical analysis of the series provides the analyst with some useful information on how to perform the seasonal adjustment and choose the parameters, and reveals possible problems in the data. This analysis should be carried out on unadjusted data and the initial run of the seasonal adjustment software.

The analyst should also consider information on:

- The length of the series and model span;
- The presence of zeros or outliers or problems in the data;
- The structure of the series: presence of a trend-cycle, of a seasonal component, volatility etc.;
- The presence of possible breaks in the seasonal behaviour;
- The decomposition scheme (additive, multiplicative).

More sophisticated graphs, such as the spectrum or the autocorrelograms, could provide information on the presence of a seasonal component and/or a calendar effect. Based on RegARIMA residuals, these graphs are also tools for checking that the seasonal and calendar effects are taken into account in the model, i.e. they usually disappear after modelling. Additionally, histograms of the residuals can be checked.

Options

- Not considering graphical evidence.
- Use of basic graphs in the time domain (i.e. unadjusted time series, log-transformed time series, outlier adjusted time series, year-on-year rates of change for the unadjusted and calendar adjusted data).
- Use of additional graphs (including the spectrum, the autocorrelograms and histograms) before and after a suitable transformation of the series and for the RegARIMA residuals.

Alternatives (*)

A) A detailed graphical analysis for the unadjusted data and the RegARIMA residuals, based on basic graphs, autocorrelograms, spectra and histograms, is performed for the most important series to be adjusted at least once a year and the related outcomes should be documented.

B) A first graphical analysis in the time domain, performed on most important series and, whenever possible, on all of them and the related outcomes should be documented.

C) No graphical analysis.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.3. Calendar adjustment

Description

The aim of calendar adjustment is to obtain a seasonally adjusted series whose values are independent of the length and the composition in days (number of Mondays, Tuesdays, etc. or number of working days and weekend days) of the month/quarter.

It should be noted that the length and day-of-week composition of the month/quarter is partly seasonal: March has always 31 days and has, on average, more Mondays than February. Since the seasonal part is already captured by the seasonal adjustment filters, it should not be removed during calendar adjustment. Working- or trading-day effects - in the narrow sense - should therefore be associated with the non-seasonal part of the effect. This partial effect can be estimated by centring the calendar regressor, i.e. removing its long-term monthly/quarterly average.

Additionally, the number of working days and national holidays are complementary. Given the length of month, a higher number of working days always implies a lower number of non-working days (Sundays, national holidays which are not Sundays, and in most fields of economic activity, Saturdays). Therefore, a normal working day adjustment implicitly adjusts for moving national holiday effects. However, non-Orthodox and Orthodox Easter, for example, may have differing effects on neighbouring months or quarters. This can cause problems for the interpretation of data in the respective periods. Hence, such effects are part of a separate calendar adjustment.

The calendar adjustment should not result in frequent large revisions when additional data become available, if it does, it is an indication that the method's estimates are not reliable.

Options

- Proportional working day adjustment - in this case, the effects of working days are estimated by counting the proportion of them in the month/quarter.
- Regression-based adjustment - in this case, the effect of the calendar is estimated in a regression framework. Within the regression approach, the effect can be estimated by using a correction for the length of the month or leap year, regressing the series on the number of working days, etc.
- RegARIMA-based adjustment, same as before but with an ARIMA structure for the residuals.
- No adjustment.

Alternatives (*)

A) RegARIMA approach, with all pre-tests for number of regressors, length and composition of month, national and religious holiday effects, check of plausibility of effects (sign and size of estimated coefficients), etc. The calendar adjustment should be done for those time series for which there is an economic rationale for the existence of calendar effects and statistical evidence.

B) Regression approach for all calendar effects based on the (provisional) irregular component (e.g. X11Regression included in X-12-ARIMA). The calendar adjustment should be done for those time series for which there is statistical evidence and an economic explanation for the existence of calendar effects.

C) Proportional adjustment, other adjustment or no adjustment at all (when this leaves evidence of calendars effects in the adjusted series).

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.4. National and EU/euro area calendars

Description

In order to take into account the national and EU/euro area idiosyncrasies, different calendars are needed. They are used to calculate calendar regressors for calendar adjustment.
An EU/euro area calendar, built from national calendars, i.e. by averaging the national numbers of working or trading days using appropriate weights, can be considered an alternative in cases of direct seasonal adjustment of unadjusted EU/euro area aggregates. It is not easy to create and maintain national and European calendars and their effectiveness is strongly dependent on their regular and accurate maintenance.

Member States should compile, maintain and update their national calendars or, as a minimal alternative, supply a historical list of public holidays including, whenever possible, information on compensation holidays. Moreover they should provide, in advance, the calendar for the year t+1 or the corresponding holidays list.

Options

- Use of default calendars.
- Use of national calendars or the EU/euro area calendar as appropriate.
- Identification of series not requiring calendar adjustment.

Alternatives (*)

A) The use of national calendars is recommended at the Member State level or for European aggregates when an indirect approach is chosen. The use of EU/euro area calendars is recommended when a direct approach is chosen for the seasonal adjustment of European aggregates in particular if national calendar adjusted series are not available, incomplete or of insufficient statistical quality. The calendar information used should be available to the public (at least upon request).

B) Use of default calendars (defined within the tool chosen for seasonal adjustment) complemented by an historical list of national public holidays to be corrected for (through the use of appropriate regressors).

C) Use of default calendars, without any reference to national and European public holidays, as well as no calendar adjustment irrespective of diagnostic evidence of calendar effects.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.5. Choosing the frequency of time series for calendar adjustment

Description

The calendar effects of a quarterly time series that is calculated from monthly data (sum or average) can be estimated in two different ways: either directly by estimating the calendar effects using the quarterly figures, or indirectly by estimating the monthly calendar adjusted results and transforming them to the quarterly frequency (sum or average).
Of course, the effects of individual days can be quantified exactly if and only if all statistics are reported daily. In monthly or quarterly time series calendar day influences can only be estimated.
In a monthly time series, for example, the effect of 29 February is mixed with all influences from 1 to 28 February. In a quarterly time series, the effect of 29 February is also combined with the influences of January and March. Additionally, the effects of Easter in a monthly time series can be estimated using the figures for March and April only. Estimates based on quarterly data, however, are also influenced from the figures of January, February, May and June which are included in the first and second quarter, respectively. Therefore, the precision of a calendar effect estimate is normally lower at quarterly frequency and increases with the number of observations within a year.
Calendar effects do not exactly balance out each other in each calendar year, because of the leap year and of different numbers of working days. Therefore, calendar adjusted annual data can be consistently calculated from the corresponding monthly or quarterly results. A direct estimate of calendar adjusted annual results, however, is not possible in practice because estimation techniques cannot separate the calendar effects from business cycle influences in this case.

Options

- Calculate calendar factors separately for each frequency.
- Use the highest frequency available (monthly, quarterly) in order to estimate calendar effects and derive lower frequency calendar adjusted results (quarterly, annual).
- No calendar adjustment for data at a quarterly or annual frequency.

Alternatives (*)

A) Use the highest frequency available for estimating calendar effects and derive lower frequency calendar adjusted results.

B) Estimate quarterly calendar adjusted figures directly and derive annual calendar adjusted figures indirectly.

C) Do not calendar adjust quarterly data, irrespective of whether such effects exist. Adjust annual figures directly.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.6. Other calendar related and weather effects

Description

The effects of bridging day, school holiday and weather effects that are not part of the seasonal or the calendar component can also be estimated with RegARIMA models and appropriate regressors.

Bridging days are days lying between a public holiday and a weekend. They are counted in purely calendar terms as full working days, but the fact that they lie between public holiday and a weekend means that such days can be used to "work off" overtime that has been accumulated or for taking a long weekend. In this sense, they would be expected to have an influence on the time series, e.g. a negative impact on the industrial production. Empirical investigations show clear evidence of these effects. However, the same investigations indicate an over-adjustment in months which have two single bridging days. Additionally, the use made of single bridging days might depend on the prevailing economic situation. In times when the economy is weak, bridging days could be used, in particular, to stop production temporarily, whilst, in times of considerable growth, there would be a tendency to continue working. If the effect of the concentration of leave on single bridging days is eliminated, the countermovement of less leave should actually also be adjusted over the rest of the year so that no distortion of the business cycle occurs. However, the estimation of this countermovement is often not possible in practice.

The basic idea of the vacation adjustment is that the economic activity in a month/quarter is likely to depend on the timing of the school holidays. Workers with school-age children take leave mainly during the school holidays, and hence interrupt their work. Empirical investigations show clear evidence of these effects. However, monthly-specific estimates of the influences of the school holidays are based in each case on only a very limited number of observations. A small number of values can hence exert a relatively major influence on the result. What is more, the addition of new values may lead to significant changes, and hence revisions. Since more holidays in a month always correspond to fewer holidays in other months, one might accept that the estimated positive and negative holiday effects roughly balance each other out throughout the year. In empirical examples, however, this is not the case.

Similar to school holidays, weather-induced effects do not occur repeatedly with exactly the same intensity in the same month each year. Rather, the impairment of construction activity in the cold season depends on the intensity and, above all, on the length of the extreme weather periods. In this sense, one may attempt to model the weather dependency of, for instance, construction output using suitable regressors in order to make it easier to draw conclusions as to economic developments. However, exceptionally severe weather-related production impairments in the cold season frequently lead to positive catch-up effects in the spring. If the winter shortfall was adjusted, the indirect knock-on effect would also have to be removed from the spring calculation in order not to unilaterally distort the business cycle picture.

Options

- Not adjusting for bridging day, school holiday and weather-induced effects in order to avoid the problems described and the high costs of constructing the variables.
- Adjusting for as many effects as possible in order to smooth the time series.
- Estimating as many effects as possible and deleting them from the unadjusted data in order to ensure seasonal and calendar estimates are not influenced by these effects. Then, results are produced which are only adjusted with these normal seasonal and calendar factors. These seasonally and calendar adjusted figures show the full effects estimated in the first step.

Alternatives (*)

A) Only calendar and seasonal effects are adjusted (no additional bridging day, school holiday and weather-induced effects). Studies on the latter effects, however, are done in order to inform data users.
B) Estimate these effects and delete them from the unadjusted data in order to better estimate seasonal and calendar factors which are not influenced by these effects (Then, results are produced which are adjusted only with these normal seasonal and calendar factors.).
C) Adjust for as many effects as possible.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.7. General principles of outlier detection and correction

Description

Outliers are abnormal values of the series. They can be modelled in a number of ways, the most important being:

- additive outliers (abnormal values in isolated points of the series);
- temporary changes (series of outliers with temporarily decreasing effects on the level of the series);
- level shifts (series of innovation outliers with a constant long-term effect on the level of the series, where for innovation outlier is meant anomalous values in the innovation series);
- ramps (which describe a smooth, linear or quadratic transition between two time points unlike the abrupt change associated with level shifts);
- temporary level shifts (where the level shift has short-term rather than a long-term effect).

Seasonal adjustment methods are likely to be severely affected by the presence of such outliers. Therefore they should be detected and replaced simultaneously or before estimating the seasonal and calendar components in order to avoid a distorted or biased estimation of them. However, outliers should remain visible in the seasonally adjusted data (unless they can be associated with data errors) because they give information about some specific events (e.g. strikes). Therefore, the outliers should be reintroduced in the time series after having estimated the calendar and/or seasonal component (which is the normal procedure in commonly used methods): additive outliers and temporary changes are assigned to the irregular component, level shifts, ramps, and temporary level shifts are part of the trend-cycle. This means that outliers due to data errors in the unadjusted data have to be corrected before starting the seasonal adjustment procedure.

Seasonal breaks (sometimes called seasonal outliers or change of regimes) are a special case. They describe an abrupt increase or decrease of the seasonal component for a specific month or quarter and are of permanent nature. Therefore, seasonal breaks belong to the seasonal component and are removed from the unadjusted data in the normal process of seasonal adjustment.
RegARIMA models provide a possibility for modelling outliers identified by the user and an automatic procedure to detect outliers and to correct for their effects. A relatively large number of identified outliers as compared to the time series' length might indicate inappropriateness of the ARIMA model chosen. If problems occur, it might help to shorten the time span for outlier detection or to change the critical value of the statistical tests which are used for identifying outliers.

Options

- Selecting the types of outliers to be considered for pre-testing.
- Removal of outliers before seasonal adjustment is carried out.
- Including the most important outliers in the regression model as intervention variables.
- No outlier identification.

Alternatives (*)

A) The series should be checked for outliers of different types (see description). Once identified, outliers caused by data errors should be corrected in the unadjusted (raw) data before pre-treatment. Remaining outliers should be explained/modelled using all available information. Outliers for which a clear interpretation exists (e.g. strikes, consequences of changes in government policy, territory changes affecting countries or economic areas, etc.) are included as regressors in the model, even if their effects are somewhat below the general significance threshold.
B) As A), but with a completely automatic procedure for detecting and correcting outliers.
C) No preliminary treatment of outliers.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.8. Treatment of outliers at the end of the series and at the beginning of a major economic change

Description

Outliers at the ends of the series present unique problems:

- a level shift at the first data point cannot be estimated since the level of the series prior to the given data is unknown;
- a level shift at the last data point cannot be distinguished from an additive outlier there;
- a level shift at the second data point cannot be distinguished from an additive outlier at the first data point;
- a temporary change at the last data point cannot be distinguished from an additive outlier there etc.

These conceptual limitations create problems concerning the estimation of the trend-cycle and/or the irregular component because a level shift at the end of a series can be wrongly treated as an additive outlier and, hence, wrongly assigned to the irregular component and not the trend-cycle. However, these problems do not affect the seasonally adjusted results because the latter contain both the trend-cycle and the irregular component. Which outlier at the end of a time series is assigned to the trend-cycle and which outlier to the irregular component is not relevant for estimating the seasonal and calendar component and therefore not relevant for calculating seasonally adjusted data. All that matters is that atypical values are treated as outliers.
Major economic changes, errors or problems in the reported data or the statistical compilation process firstly appear as an additive outlier at the end of the series. Additional observations are needed before changing the outlier type from an additive outlier to a transitory change or a level shift. However, changing the outlier type can have an impact on the series revisions and the choice of the type of outlier can influence turning point identification. Caution is necessary in these cases.
A seasonal outlier is an exception. This kind of outlier is assigned to the seasonal component and cannot be distinguished from an additive outlier at the end of a time series using statistical tests. Fortunately, seasonal outliers are extremely rare because most of the reasons for seasonality (length of a month, Christmas etc.) are stable over time. Therefore, there should be clear indications of the reasons for seasonality change at the end of a series before modelling seasonal outliers.
Based on the assumption that the abrupt extraordinary effects of financial and/or economic crises do not happen year after year with roughly the same intensity they should not influence the seasonal estimate. Hence, using appropriate outlier variables is important. This approach ensures that the full effects of the crises are visible in the seasonally adjusted results.

Options

- Never modelling outliers at the end/beginning of a series because the type of outlier cannot be identified automatically.
- Fully trusting automatic outlier detection and replacement procedures.
- Modelling outliers at the end/beginning of the time series in accordance with statistical criteria (t-test) and economic information, especially strong economic changes are modelled.

Alternatives (*)

A) Outliers are modelled at the end of a time series based on statistical criteria and economic information, especially in times of strong economic changes.
B) Using fully automatic outlier detection procedures.
C) Never model outliers at the beginning/end of a series.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.9. Model selection

Description

Model selection pertains to: criteria to select the appropriate model for pre-adjustment and seasonal adjustment or forecast extension for seasonal adjustment; log versus non-log specification of the model; order of differencing for the seasonal and non-seasonal part; use of additive or multiplicative components (see item 2.10); statistical checking of the adequacy of the estimated model; analysis of decomposition on the basis of the chosen model; etc.

There are various ways of selecting an appropriate model. Unit root tests and information criteria can be used, forecast properties can help to select a model from a list of models, and non-automatic procedures are useful (e.g. ACF, PACF of model residuals for different orders of integration). All these different possibilities aim at finding a parsimonious model which describes the relevant features of the data generating process that is assumed to underlie the time series in question.

This item is much more important for model-based methods than for non-parametric ones.

Options

- Automatic model selection.
- Model selection based on a model-set.
- Manual model selection.

Alternatives (*)

A) Selection of a model from a large number of models, after checking for model adequacy using standard statistical tests (e.g. normality, heteroskedasticity, serial correlation, etc.) and spectrum diagnostics for the model residuals. Using non automatic model selection for important or problematic series.

B) As before, but with a completely automatic procedure.

C) Selection based on restricted number of pre-defined models that have not been tested for adequacy with the set of series being adjusted.

(*) A) Best alternative; B) Acceptable; C) To be avoided

2.10. Decomposition scheme

Description

The decomposition scheme specifies how the various components - basically trend-cycle, seasonal, calendar component and irregular – combine to form the original series. Usually, the decomposition scheme is multiplicative (either pure multiplicative or log-additive), because in most economic time series, the magnitudes of the seasonal component appear to vary proportionally to the level of the series. If these two components are independent from each other, the additive scheme is used. The pseudo-additive approach is preferable for time series that generally show a multiplicative behaviour, where, however, at least one period always goes down close to zero.
The algorithms underlying model based and moving averages based methods provide the user with an automatic test for log-transformation. The result of this test will also suggest the choice of the decomposition scheme.
For series with zero or negative values the additive decomposition is automatically selected by seasonal adjustment procedures, regardless of the real decomposition scheme.
The choice of the decomposition scheme and the choice of the differencing orders aim to achieve weak stationarity. These two decisions have the greatest impact on forecasts and on model-based seasonal adjustments and trend-cycle estimates at the end of series.

Options

- Automatic decomposition scheme selection.
- Manual decomposition scheme selection after graphical inspection of the series.
- For series with zero or negative values, adding a constant to make the series positive and select the appropriate decomposition scheme.
- For stationary series (with no trend in mean and in variance) the additive decomposition is used.

Alternatives (*)

A) Automatic decomposition scheme selection using appropriate criteria (e.g. information criteria) after graphical inspection of the series. Special investigations for series with zeros or negative values (i.e. adding a constant before testing for the decomposition scheme and checking the impact on the seasonally adjusted series). Use of non-automatic selection for more problematic series.
B) Fully automatic decomposition scheme selection using information criteria.
C) Use of fixed decomposition scheme (e.g. multiplicative for positive series, additive for series with zeros or negative values).

(*) A) Best alternative; B) Acceptable; C) To be avoided

3. Seasonal adjustment

3.1. Choice of seasonal adjustment method

Description

Currently the most commonly used seasonal adjustment methods are the signal extraction approach (Burman, 1980; Gomez and Maravall, 1996) that starts from an ARIMA modelling of the complete series, and the semi-parametric approach based on a set of predefined moving averages (Shiskin et al, 1967; Findley et al, 1998).
Unobserved component methods (Harvey 1980) based on state space models represent a reasonable alternative, provided they allow for a complete calendar and outlier treatment and include an adequate set of diagnostics.

Options

— The semi-parametric method based on a predefined set of symmetric moving averages.
— The signal extraction method based on an ARIMA modelling of the series.
— Unobserved component methods based on state space models.
— Regression methods.
— Spectral methods.

Alternatives (*)

A) The signal extraction method based on an ARIMA modelling of the series and/or the semi-parametric method based on a predefined set of symmetric moving averages should be used for seasonal adjustment. The choice between the methods should take into account statistical investigations and past practices.
B) Use of unobserved component methods based on state space models, provided they allow for a complete calendar and outlier treatment and include an adequate set of diagnostics.
C) Use of other methods.

(*) A) Best alternative; B) Acceptable; C) To be avoided

3.2. Choice of the software

Description

There are many software packages implementing the recommended seasonal adjustment methods. To choose from them, the user should take into account several aspects: versioning, maintenance and support, compatibility with these guidelines, documentation, costs, open-source architecture, completeness, user-friendliness, suitability for mass production, computational efficiency, etc. Software should be updated according to a well-defined release strategy. Using the same software release across domains and countries is beneficial for coherence and transparency. Methods and tool versions currently used in data production should be clearly communicated to users.

Software packages officially released by statistical institutions and designed to fully implement the recommended methods being in line with these guidelines should be favoured.

When migrating software, the impact on data should be assessed in the specific IT environment where it will be used.

Options

- Using the official software implementing the recommended methods.
- Using software packages officially approved at ESS level and implementing recommended methods.
- Using old releases of these software.
- Using commercial software implementing the recommended methods.

Alternatives (*)

A) Using freely available up-to-date software officially released by statistical institutions, preferably open-source, which fully contains the various recommended methods, follows a clear release strategy and has been thoroughly tested.

B) Using complete and well tested implementations of recommended methods included in statistical commercial or free packages.

C) Using incomplete or obsolete versions of official software or the use of commercial packages based on incomplete, obsolete or old versions of official software, or any other software implementing a non-recommended method.

(*) A) Best alternative; B) Acceptable; C) To be avoided

3.3. Temporal consistency between unadjusted and seasonally adjusted data

Description

It is unrealistic to assume that seasonal adjustment is neutral over the whole year (either calendar or financial), especially in presence of evolving seasonality, calendar effects and outliers. It is possible to force the sum (or average) of seasonally adjusted data over each year to equal the sum (or average) of the unadjusted data, but, from a theoretical point of view, there is no justification for this.
The disadvantages in forcing equality over the year between the seasonally adjusted data and the unadjusted data (sum or average) are:

- Bias in the seasonally adjusted data, especially where calendar and other non-linear effects are relevant;
- The final seasonally adjusted data are not optimal;
- Additional post-processing calculations are required.

The only benefit of this approach is that there is consistency over the year between adjusted and unadjusted data. This can be of particular interest when low-frequency (e.g. annual) benchmarking figures officially exist (e.g. National Accounts, Labour market) where users' needs for temporal consistency are stronger.

Options

- Do not apply any constraint.
- Apply constraining techniques.
- Constrain equality over the year of seasonally adjusted data to unadjusted data (sum or average).
- Constrain equality over the year of seasonally adjusted data to calendar (only) adjusted data (e.g. sum or average).

Alternatives (*)

A) In principle do not constrain the seasonally adjusted data to the unadjusted data or the calendar adjusted data over the year, unless strong users’ requirements justify the benchmarking. In this case, in the presence of calendar effects, constrain the seasonally and calendar adjusted data to the calendar adjusted data over the year. Otherwise, constrain the seasonally adjusted data to the unadjusted data over the year. Recognised benchmarking methods preserving short-term movements should be used.

B) Do not constrain the seasonally adjusted data to the unadjusted data or the calendar adjusted data over the year.

C) Constrain data even in absence of users’ requirements; use a benchmarking technique that generates seasonality or a benchmarking technique that do not preserve short-term movements.

(*) A) Best alternative; B) Acceptable; C) To be avoided

3.4. Direct and indirect approaches

Description

Economic indicators are often computed and reported according to a certain classification or breakdown: most short-term statistics are computed according to the NACE classification. Unemployment data are published by sex and age etc. In this case, the seasonally adjusted aggregates can be computed either by aggregating the seasonally adjusted components (indirect adjustment) or adjusting the aggregate and the components independently (direct adjustment). These two strategies result in different seasonally adjusted aggregates. The issue of direct versus indirect adjustment has a great relevance for users who consider the consistency between disaggregated and aggregated data to be important. Which of these approaches is preferred is still an open question since neither theoretical nor empirical evidence uniformly favours one approach over the other. In practice a mix of the two approaches may be used. As the quality of the adjustments cannot always be guaranteed at the lower level of the classification, a direct approach is used up to a certain level and the upper aggregated series are then computed indirectly. The choice of the cut-off level is usually linked more to user needs than to statistical considerations. For an informed choice between the direct and the indirect approach producers should consider:

- Descriptive statistics on the quality of the indirect and direct seasonally adjusted estimates, e.g. the smoothness of aggregates, presence of residual seasonality, stability of the model and measures of revisions;
- Characteristics of the seasonal pattern in the component time series and similarities/differences between them;
- User demand for consistent and coherent outputs, especially where they are additively related;
- The cut-off level.

Options

- Direct approach where all series at the various aggregation levels are directly seasonally adjusted using the same method and software.
- Direct approach, as described above, with the distribution of discrepancies by means of multivariate benchmarking techniques (if discrepancies are small enough).
- Indirect approach where the seasonal adjustment of components occurs using the same approach and software, and then totals are derived by aggregation of the seasonally adjusted components.
- Direct approach applied to the disaggregated data until a certain level and the indirect approach applied to upper aggregated series.

Alternatives (*)

A) Producers should carefully consider the application of either direct or indirect adjustment and make an informed choice based both on all mentioned statistical criteria to assess the quality of the adjustment and user demand. The direct approach should be preferred for clarity, especially when component series show similar seasonal patterns. The production of consistent seasonally adjusted data and the use of coherent seasonal adjustment parameters should be monitored, especially if the direct approach is used. The indirect approach should be preferred where component series show significantly different seasonal patterns. The presence of residual seasonality and calendar effects should be monitored, especially in the indirectly adjusted series. If the quality of the adjustment cannot be guaranteed at the lower level of disaggregation and there is a need of ensuring the consistency between aggregates and components at macro-level, the direct adjustment can be used at lower disaggregation level and the indirect one at upper disaggregation level.

B) The choice follows only user requirements for consistency between lower and higher level aggregates (e.g. additivity). The use of either the direct approach, associated with benchmarking techniques to remove discrepancies, or the indirect approach is acceptable. The presence of residual seasonality and calendar effects should be monitored, especially in the indirectly adjusted series.

C) Choosing either direct or indirect approach without any justification.

(*) A) Best alternative; B) Acceptable; C) To be avoided

3.5. Direct versus indirect approach: dealing with data from different agencies

Description

Seasonal adjustment can be performed at different geographical aggregation levels (horizontal aggregation). This case is relevant for European aggregates, which are usually derived as an aggregation of corresponding national ones. The question of direct or indirect seasonal adjustment is even more relevant in the case of geographical aggregation for those users who consider the consistency between disaggregated and aggregated geographical data to be priority especially for their forecasting exercise of the geographical aggregate.

Options

- Seasonal adjustment can be performed either by national or European statistical institutions (e.g. NSIs and Eurostat) on geographical component series by using the same method and software, and then totals derived by their aggregation (decentralised or centralised indirect approach).
- All time series, including geographical aggregates, are seasonally adjusted on an individual basis.
- Same as before, but aggregation constraints imposed ex-post by means of multivariate benchmarking techniques.
- Each geographical component is seasonally adjusted, even by using disparate methods and software, and the seasonally adjusted geographical aggregates are derived from the seasonally adjusted components (mixed indirect approach).

Alternatives (*)

A) The direct approach is recommended when geographical component series show similar seasonal patterns or where there is a lack of harmonisation in the use of national practices. The production of consistent seasonally adjusted data and the use of coherent seasonal adjustment parameters should be monitored, especially if the direct approach is used. The centralised indirect approach is recommended for specific cases where it has been agreed that seasonal adjustment should be delegated to the centralised agency. The decentralised indirect approach can also be used in the presence of a satisfactory degree of harmonisation of national seasonal adjustment practices and where component series do not show similar seasonal patterns. In both centralised and decentralised indirect approaches, aggregates should be checked for the presence of residual seasonality.

B) Under strong user's requirements for consistency between aggregates and geographical components, and in the presence of a satisfactory degree of harmonisation of national seasonal adjustment practices, the decentralised indirect approach can be also used even when national series show similar seasonal patterns. However, indirectly adjusted aggregates should be checked for the presence of residual seasonality.

C) The use of the mixed indirect approach.

(*) A) Best alternative; B) Acceptable; C) To be avoided

3.6. Different seasonal filters for different months/quarters

Description

In the standard approach of seasonal adjustment, one seasonal filter is applied to all individual months/quarters. The estimation of seasonal movements is therefore based on sample windows of equal length for each individual month/quarter (i.e. for each month/quarter the seasonal filter length or the number of years representing the major part of the seasonal filter weights is identical). This approach relies on the assumption that the number of past periods, in which conditions causing seasonal behaviour are sufficiently homogenous, is equal for all months/quarters.

However, this assumption does not always hold. Seasonal causes may change in one month, while staying the same in others. In German retail sales, for example, the peak in December had been steadily decreasing over years, especially because Christmas bonuses were being paid by fewer companies or were simply being lowered compared to the regular monthly salary. The Easter business in March and April, respectively, and the traditionally moderate shopping behaviour in a summer vacation month such as July are barely affected by this. In such cases it makes sense to use a shorter seasonal filter for December and longer (normal) ones for the remaining months of the year.

Additionally, different filters for different months/quarters can be used in the context of seasonal heteroskedasticity (see item 6.4). In correspondence to the overall moving seasonality ratio used in the X-11 algorithm for automatic selection of seasonal filters, monthly/quarterly specific moving seasonality ratios can be calculated in order to select monthly/quarterly specific seasonal filters. Care should be taken because these monthly/quarterly specific ratios may be highly dependent on individual observations.

Seasonal outliers can be interpreted as an extreme form of period-specific seasonal filters. Their usage can change estimated seasonal movements abruptly in one month/quarter, while the others are hardly affected.

Options

- Graphical analysis to determine the necessity of different filter lengths (period-specific SI-graphs).
- Calculation of monthly/quarterly moving seasonality ratios.
- Acquiring information about state and development of period-specific causes of the seasonal figure.
- Persistent use of standard analysis tools.

Alternatives (*)

A) Information about state and development of period-specific causes of the seasonal figure is actively acquired. Together with monthly/quarterly moving seasonality ratios and graphical analysis it forms the basis for the decision on the use of period-specific seasonal filters, at least for the adjustment of important macroeconomic aggregates.

B) Available information about state and development of period-specific causes of the seasonal figure as well as monthly/quarterly moving seasonality ratios and graphical analysis form the basis for the decision on the use of period-specific seasonal filters, at least for the adjustment of major macroeconomic aggregates.

C) Available information about special developments of the seasonal figure is not considered for seasonal adjustment.

(*) A) Best alternative; B) Acceptable; C) To be avoided

4. Revision policies

4.1. General revision policy and release calendar

Description

Revisions of seasonally adjusted data take place for two main reasons. First, seasonally adjusted data may be revised due to a revision of the unadjusted data, which may occur due to the availability of an improved information set (in terms of coverage and/or reliability). Second, revisions of seasonally adjusted data can take place because of a better estimate/identification of the seasonal pattern due to new information provided by new unadjusted data and/or due to the characteristics of the filters and procedures removing seasonal and calendar components. As far as revisions are solely based on new information, they are mostly welcome. However, in seasonal adjustment it may be the case that just one additional observation results in revisions of the seasonally adjusted data for several years, which sometimes confuses users.

The challenge is to find a balance between the need for the best possible seasonally adjusted data, especially at the end of the series, and the need to avoid insignificant revisions that may later be reversed (the trade-off between the accuracy of seasonally adjusted data and their stability over time).

Before developing a revision policy, consideration needs to be given to the needs of users and resources available to implement the policy. The policy should refer to and possibly define at least the following points: the frequency and relative size of revisions due to seasonal adjustment; the accuracy of the seasonally adjusted data, the time period over which the unadjusted data have been revised and the relationship between the timing of publication of revisions to the seasonally adjusted data and publication of the revisions to the unadjusted data.

It is important that the revision policy is as coherent and transparent as possible and that it does not mislead the interpretation of the economic picture.

Options

- Revise seasonally adjusted data in accordance with a well-defined and publicly available revision policy and release calendar.
- Revise both unadjusted and seasonally adjusted data between two consecutive scheduled releases of the release calendar.
- Perform revisions on an irregular basis and/or do not revise at all.

Alternatives (*)

A) Revisions to seasonally adjusted data are published in accordance with a coherent, transparent and officially published revision policy and release calendar, which is aligned with the revision policy and the release calendar for the unadjusted data. Revised seasonally adjusted data should not be released more often than unadjusted data. The public is informed about the size, direction and volatility of past revisions of important seasonally adjusted macroeconomic variables.

B) Revisions to seasonally adjusted data are published in accordance with a coherent, transparent and officially published revision policy and release calendar.

C) No revision of seasonally adjusted data, absence of a clear and public revision policy, absence of a public release calendar, or policies leading to the publication of misleading information especially for the current period.

(*) A) Best alternative; B) Acceptable; C) To be avoided

4.2. Concurrent versus current adjustment

Description

The way in which seasonal adjustment is carried out has implications for the revisions of seasonally adjusted data. The possible strategies range between the following extremes:

— Current adjustment

The model, filters, outliers and regression parameters are re-identified and the respective parameters and factors re-estimated at appropriately set review periods. The seasonal and calendar factors to be used to adjust for seasonal and calendar effects of new unadjusted data in-between the review periods are those estimated in the previous review period and forecasted up to the next review period.

— Concurrent adjustment

The model, filters, outliers, regression parameters are re-identified and the respective parameters and factors re-estimated every time new or revised data become available.

The current adjustment strategy minimises the frequency of revisions and concentrates the revisions coming from seasonal adjustment on the review period. The concurrent adjustment strategy generates the most accurate seasonally adjusted data at any given time point but will lead to more revisions, many of which will be small and perhaps in opposing directions.

Both of these strategies have drawbacks: for example, the current adjustment strategy can lead to a lack of precision in the estimation of the latest adjusted figures and the concurrent adjustment strategy can lead to a high instability of the seasonal pattern. Therefore, in practice, balanced alternatives between these two are followed in order to cope with data peculiarities and aiming to provide good quality adjustment:

— Partial concurrent adjustment

The model, filters, outliers and calendar regressors are re-identified once a year and the respective parameters and factors re-estimated every time new or revised data become available.

— Controlled current adjustment

Forecasted seasonal and calendar factors derived from a current adjustment are used to seasonally adjust the new or revised unadjusted data. However, an internal check is performed against the results of the "partial concurrent adjustment", which is preferred if a significant difference exists. This means that each series needs to be seasonally adjusted twice. The approach is only practicable for a limited number of important series.

A full review of all seasonal adjustment parameters should be undertaken at least once a year and whenever significant revisions occur (e.g. annual benchmark).

Options

- Current adjustment with review on annual basis.
- Current adjustment with review less frequent than one per year.
- Concurrent adjustment.
- Partial concurrent adjustment.
- Controlled current adjustment.

Alternatives (*)

A) When past data are revised for less than two years and/or new observations are available, partial concurrent adjustment is preferred to take into account the new information and to minimise the size of revisions due to the seasonal adjustment process.
However, if the seasonal component is stable enough, controlled current adjustment could be considered to minimise the frequency of revisions. In this case, a full review of all seasonal adjustment parameters should be undertaken at least once a year.
When revisions covering two or more years occur (as observed in national accounts) model, filters, outliers and regression parameters have to be re-identified and re-estimated.

B) Current adjustment with a full review every year.

C) Current adjustment without annual review as well as concurrent adjustment.

(*) A) Best alternative; B) Acceptable; C) To be avoided

4.3. Length for routine revisions

Description

As a rule, when seasonal factors are re-estimated the seasonally adjusted results from the beginning of the time series change. Two factors speak in favour of always carrying out a revision for the whole series: the methodically identical treatment of all values and the fact that the calculation of the seasonally adjusted results is easy to understand and to replicate. It is, however, questionable whether a current newly added figure really contains relevant information for significant revisions of the estimation of the usual seasonal fluctuations in previous decades. As a way of balancing the information gain and the revision length, the revision period for the seasonally adjusted data is often, in practice, limited.
The date for the earliest revision of the seasonally adjusted data should be set at the beginning of a calendar year, not less than three years before the revision period of the unadjusted data. This date should be kept fixed for up to five years for transparency reasons. Statistical agencies should periodically investigate the existence of breaks in the revised series. For the earlier periods, seasonal factors could be frozen. This choice takes into account the extent of revisions of unadjusted data as well as the normal convergence properties of seasonal adjustment filters and the period for the filter to become symmetric.

Options

- Limit the revision period of the seasonally adjusted data to three years before the revision period of the unadjusted data and freeze the older data.
- Fix a starting date for the earliest revision.
- Revise the whole time series.
- Revise the seasonally adjusted data for a period no longer than the revision period of the unadjusted data.
- Do not revise seasonally adjusted data when unadjusted data are revised.

Alternatives (*)

A) A starting date for the earliest revision of the seasonally adjusted data should be set at the beginning of a year, three years before the revision period of the unadjusted data. This date should be kept fixed for up to five years. Statistical agencies should periodically investigate for the existence of breaks in the revised series. When breaks are detected, statistical agencies can decide to reset the starting date.
B) Revise the whole time series.
C) Do not revise seasonally adjusted data when unadjusted data are revised, or revise for a shorter period than the revision period of the unadjusted data plus three years.

(*) A) Best alternative B) Acceptable C) To be avoided

4.4. Length for major revisions

Description

Major revisions of seasonally adjusted data are exceptional and substantial changes in published results occurring for one or more of following reasons:

- Major revisions of unadjusted data due to changes/updates of definitions/concepts/nomenclatures/ sampling scheme/legal acts, etc.;
- Change of seasonal adjustment method;
- Change of seasonal adjustment approach, such as moving from direct to indirect;
- Inclusion of a user-defined variable in pre-treatment to account for country/domain-specific holidays.

Data producers usually take advantage of a major revision to introduce methodological improvements. This is good practice as it prevents revisions from occurring more often than necessary. Producers should identify the impact of each single change on the total revisions of the time series and inform the users. Major revisions affect a large part of the time series (unadjusted and seasonally adjusted) and sometimes even the complete time series.

When major methodological breaks in the unadjusted data occur, the seasonal adjustment could be separated into two different parts: one before and one after the break (provided that these periods are long enough for seasonal adjustment).

Major revisions are expected and planned well in advance. Users should be informed in advance and warned that considerable changes are expected in the time series. A policy for major revisions of seasonally adjusted data should specify at least the following: the pre-announcement strategy, how to communicate information on causes and impacts, expected length and depth.

Options

- Revise the whole time series.
- Revise the seasonally adjusted data for a period as long as the one for the unadjusted data.
- Do not perform any revision.

Alternatives (*)

A) In situations where the unadjusted data are substantially revised, the seasonally adjusted series should be revised accordingly. If major methodological breaks in the unadjusted data occur, the seasonal adjustment should account appropriately for the methodological break; when there is a change in the seasonal adjustment methodology or software, the need to revise the whole time series has to be carefully considered; users are informed in advance when a major revision will take place.

B) Revise the whole time series in case of major revisions or when there is a change in the seasonal adjustment methodology; users are informed in advance when a major revision will take place.

C) The impact of a major revision is not checked, or the seasonally adjusted data are revised for a period shorter than the one of the unadjusted data, or no revision of seasonally adjusted data is performed in the case of a major revision of unadjusted data; users are not informed in advance that a major revision will take place.

(*) A) Best alternative B) Acceptable C) To be avoided

5. Accuracy of seasonal adjustment

5.1. Validation policy for seasonal adjustment

Description

Seasonal adjustment is a complex statistical process. Given the reliance of users on seasonally adjusted data, it is essential to validate seasonal adjustment before results are published.
The quality of seasonal adjustment can be evaluated only by using a wide range of measures. The graphical, descriptive, non-parametric and parametric criteria included in the output of the seasonal adjustment software can be complemented with additional graphical diagnostics and statistical tests.
The specific measures, such as absence of residual seasonality and stability of seasonality are discussed in item 5.2.
Furthermore, seasonally adjusted data must have a meaningful interpretation. As a consequence implausible data should not be validated even when statistical tests are successful.

Options

- Use a detailed set of graphical, descriptive, non-parametric and parametric criteria, across statistical packages, to validate the characteristics of seasonal adjusted data.
- Restrict validation to the measures included in the software used for seasonal adjustment.
- Use simple graphical inspection and descriptive statistics to validate seasonal adjustment.
- Do not validate seasonal adjustment.

Alternatives (*)

A) Use a detailed set of graphical, descriptive, non-parametric and parametric criteria, across statistical packages if necessary, to validate the seasonal adjustment. If validation fails, repeat the seasonal adjustment process in order to solve the problem (if possible).
B) Use only default criteria included within the software used for seasonal adjustment. If validation fails, repeat the seasonal adjustment process in order to solve the problem (if possible).
C) No validation of seasonal adjustment or use of only restricted graphical and descriptive statistics to validate the seasonal adjustment OR Not repeating the seasonal adjustment process if validation fails in cases A) or B) above OR validation of implausible data.

(*) A) Best alternative; B) Acceptable; C) To be avoided

5.2. Measurement for individual series

Description

All seasonal adjustment software packages provide a wide range of measures to assess accuracy and reliability. These measures are derived, to some extent, from the implemented method – but many measures are common. The aim is to assess if a seasonally adjusted time series meets the following characteristics:

- absence of model/transformation misspecification;
- absence of residual seasonal/calendar effects or over-adjustment of seasonal/calendar effects;
- absence of under/over-treatment of outliers/seasonal breaks;
- absence of instability in settings of the trend-cycle/seasonal/calendar components or pattern in the irregular component;
- absence of irregular influences in the trend-cycle, the seasonal and calendar component;
- absence of residual correlation in the model residuals.

Each of these characteristics should be tested for.

Options

- Calculate measures for all characteristics.
- Calculate measures for some characteristics.
- Do not calculate measures.
- Make decisions based on expert judgement.
- Rely on automated decisions.

Alternatives (*)

A) Calculate measures for all characteristics, do alternative runs of seasonal adjustment (if necessary), and take decisions based on expert judgement.
B) Calculate measures for all characteristics relying on automated decisions rules or calculate measures for some characteristics taking decisions based on expert judgement.
C) Do not calculate measures or calculate measures for some characteristics only relying on automated decisions.

(*) A) Best alternative; B) Acceptable; C) To be avoided

5.3. Comparison of alternative approaches/strategies

Description

To compare the accuracy and reliability of seasonal adjustment alternatives, a set of common quality measures as wide as possible should be used. The set of common quality measures should contain at least the following:

- M-statistics;
- roughness measures (smoothness of trend-cycle and of seasonal components, and in the context of indirect adjustment: R1 and R2);
- spectral diagnostics;
- pattern stability (history of revisions, sliding spans);
- presence of seasonality (for example Kendall and Friedman, Harvey Canova Hansen, Kruskal and Wallis);
- graphical inspection.

Options

- Calculate all common measures to compare approaches/strategies.
- Calculate some common measures to compare approaches/strategies.
- Calculate no common measures, or only alternative/strategy-specific measures, to compare alternatives/strategies.
- Make decisions based on expert judgement.
- Make automated decisions.

Alternatives (*)

A) Calculate all common measures making decisions on approaches/strategies based on expert judgement.

B) Calculate all common measures making automated decisions on approaches/strategies or calculate some common measures making decisions based on expert judgement.

C) Calculate no measures or calculate some common measures relying on automated decisions of approaches/strategies.

(*) A) Best alternative; B) Acceptable; C) To be avoided

6. Specific issues on seasonal adjustment

6.1. Seasonal adjustment of short and very short time series

Description

Very short series (less than 3 years) cannot be seasonally adjusted using either moving average or model based methods. Nevertheless, they could be adjusted using alternative, less standard, procedures. Short series (3-7 years) are long enough to run moving average or model based methods but remain quite short and some instability problems can occur. Several empirical comparisons have investigated the relative performance of moving average and model based methods on short time series. Moreover, back-calculated time series (even non-official) could be used to extend the sample of short or very short time series and stabilise seasonal adjustment, when they are reliable enough.
As a general rule, when the series are shorter than seven years, the specification of the parameters used for the pre-treatment and the seasonal adjustment have to be checked more often (e.g. twice a year) than in normal situations.

Options

- Use back-calculation in order to extend the time series to be seasonally adjusted.
- Do not adjust time series when they are shorter than the minimum requirement for moving average or model based methods.
- Use of alternative procedures to seasonally adjust very short time series.
- Re-specify all parameters involved in the pre-treatment and seasonal adjustment of short time series more often than in the standard case.
- Conduct comparative studies on the performances of moving average and model based methods on short time series.
- Inform users about instability problems when series are shorter than 7 years.

Alternatives (*)

A) Perform seasonal adjustment of very short series by using standard tools conditional to the availability of reliable back-calculated series. Short time series must be seasonally adjusted by using standard tools with a more frequent parameter review. Enhanced stability of short seasonally adjusted series can often be achieved by means of back-calculation. Users should be informed about problems related to the seasonal adjustment of short and very short time series.

B) Do not perform any seasonal adjustment of very short time-series; seasonally adjust short time series by means of standard tools with a more frequent parameter review.

C) Use of non-standard methods for very short time series or merely automatic use of standard methods for short ones.

(*) A) Best alternative; B) Acceptable; C) To be avoided

6.2. Seasonal adjustment of long time series

Description

The availability of long time series is of great importance for users but the maintenance of long time series is not an easy task for statistical agencies for several reasons, such as changes in definitions, methodology and classifications. Nevertheless, long time series are provided by statistical agencies either because relevant changes do not happen or because they are overcome by means of back-calculation.
In the context of seasonal adjustment it is possible to assume heuristically that long time series are those exceeding twenty years of length. Performing seasonal adjustment of long time series can be difficult. Over such a long period the underlying data generating process may change, determining changes also in the components and in the components structure. In this case, to perform the adjustment over the whole series may produce sub-optimal results, mainly in the most recent and the initial parts of the series.

Options

- Perform the seasonal adjustment on the whole time series using a unique set of settings and parameters for the pre-treatment and the seasonal adjustment.
- Perform the seasonal adjustment by partially overlapping sub-periods, each possibly longer than seven years, identified by means of an accurate investigation using statistical tests and graphical inspection.
- Perform the seasonal adjustment by sub-periods identified by either a simple, equal-length, cut rule or any subjective evaluation.
- Perform the seasonal adjustment only over the most recent period of the series.

Alternatives (*)

A) Perform the seasonal adjustment on partially overlapping sub-periods, each possibly longer than seven years, selected by means of tests and graphical inspection. Link the seasonally adjusted data of each sub-period by using the information from overlapping parts to avoid breaks. Freeze the seasonally adjusted data of former sub-periods and regularly update the seasonally adjusted data of the current sub-period.

B) Perform the seasonal adjustment by sub-periods identified by either a simple, equal-length, cut rule or any subjective evaluation. Freeze the seasonally adjusted data of former sub-periods and regularly update the seasonally adjusted data of the current sub-period.

C) Perform the seasonal adjustment on the whole time series, using a unique set of settings and parameters, or only over the most recent period of the series.

(*) A) Best alternative; B) Acceptable; C) To be avoided

6.3. Treatment of problematic series

Description

Some series can be characterised by very specific features such as:

1) High non-linearity, which does not allow the identification of a model with acceptable modelling diagnostics, even by shortening the series;
2) Significantly large irregular component which makes it difficult to split normal seasonal from irregular effects;
3) Unstable seasonality (e.g. visible in graphs or in inconsistent adjustments from overlapping spans of data);
4) Large number of outliers compared with the length of the series (i.e. more than 10% of data points).

These series cannot be submitted to standard seasonal adjustment: individual treatment should be carried out, both in terms of method and set of options. The quality of the seasonally adjusted data depends on the suitability of the adopted strategy.

Options

- To seasonally adjust only recent years of the series, if deleting earlier data makes it possible to find a model/adjustment of reasonable quality.
- To perform individual seasonal adjustment for all the problematic series.
- To perform individual seasonal adjustment only when the problematic series are relevant.
- No individual seasonal adjustment is performed.
- No seasonal adjustment is performed at all.

Alternatives (*)

A) Seasonal adjustment is performed for problematic series. A case-by-case approach to seasonal adjustment is preferred to an automatic one. The literature, the manuals and experts should be consulted in order to develop a solution. Users should be informed of the adopted strategy. If a sufficient level of quality of the output series is not achieved, even with an individual treatment, no seasonally adjusted series are published.

B) Seasonal adjustment is performed only on relevant problematic series, where failure to adjust these series leads to residual seasonality in important higher level aggregates. Other problematic series are treated in a standard way. If a sufficient level of quality of the output series is not achieved, even with an individual treatment, no seasonally adjusted series are published.

C) Seasonal adjustment is performed automatically for all series or seasonal adjustment is not performed at all on problematic series.

(*) A) Best alternative; B) Acceptable; C) To be avoided

6.4. Seasonal heteroskedasticity

Description

Seasonal heteroskedasticity is present when the variance of a time series is dependent on the time of year (month or quarter). This phenomenon is observed when values of specific months or quarters are determined by volatile conditions, which do not occur in other months/quarters. The irregularly fluctuating duration and intensity of the frost and snow period, for example, affect the production in the construction industry in the northern European countries, while there are no such volatile factors in the warm season. Therefore, in this case, the variance in winter is higher than in summer.

This issue influences, among other things, the detection of outliers. If a time-independent constant variance is assumed for their identification (as for example in the framework of RegARIMA-models), outliers are usually automatically detected only in those months/quarters that exhibit a higher variance than the others. In periods of low volatility (such as the warm season with production in the construction industry), special influences are rarely automatically identified.

Seasonal heteroskedasticity can be identified using hypothesis testing, graphs and information on the causes of seasonal behaviour and their variability. In seasonal adjustment, it can be taken into account within the X-11 algorithm for automatic detection of extreme values.

Options

- Examining time series for seasonal heteroskedasticity using:
    - statistical hypothesis testing;
    - graphs;
    - information on the causes of seasonal behaviour and their variability.
- Taking seasonal heteroskedasticity into account in seasonal adjustment, i.e. using different variances for filters for different month/quarters in order to detect extreme values.
- Ignoring the issue.

Alternatives (*)

A) Examination for seasonal heteroskedasticity using hypothesis testing, graphs and information on the causes of seasonal behaviour and their variability, at least for important macroeconomic aggregates. Taking identified seasonal heteroskedasticity into account in seasonal adjustment and detecting extreme values.

B) Automatic modelling of seasonal heteroskedasticity dependent on the outcome of a standard test.

C) Ignoring the issue.

(*) A) Best alternative; B) Acceptable; C) To be avoided

6.5. Seasonal adjustment of annually chain-linked series (Laspeyres-type)

Description

Annually chain-linked Laspeyres(-type) price or volume indices are used in several macroeconomic statistical areas, inter alia, in consumer price statistics, national accounts, short-term statistics and labour cost statistics (detailed explanations of the chain-linking techniques are provided, for example, in Chapter 6 of the Eurostat Handbook on QNA; in Chapter 2 of Understanding National Accounts by the OECD; in Chapter 9 of the Consumer Price Index Manual; in Chapter 5 of the Eurostat Handbook on Price and Volume Measures in National Accounts and in Chapter 9 of the IMF's QNA Manual).
Chain-linking has implications for seasonal adjustment. For example, chain-linking of Laspeyres(-type) indices may matter for seasonal adjustment if seasonal adjustment of a chain-linked aggregate series is derived indirectly from its chain-linked component series. As a result, the indirectly seasonally adjusted aggregate series may exhibit a different trend level than the respective unadjusted series. Such deviations in the trend levels should be monitored on a regular basis. Furthermore, chain-linking of Laspeyres(-type) series may matter also for temporal consistency between infra-annual and annual data, depending on the chain-linking technique applied.

Options

- Perform the seasonal adjustment directly on each individual chain-linked Laspeyres(-type) series.
- Perform the seasonal adjustment directly on each individual chain-linked Laspeyres(-type) series imposing temporal consistency only if unadjusted data are temporally consistent.
- Derive indirectly seasonally adjusted chain-linked Laspeyres(-type) aggregate series by aggregating the seasonally adjusted chain-linked Laspeyres(-type) component series following a sequential approach, allowing for preservation of aggregation and temporal consistency, whenever it is considered necessary.
- Perform the seasonal adjustment on unchained series.

Alternatives (*)

A) Perform seasonal adjustment on annually chain-linked Laspeyres(-type) series and decide between direct and indirect adjustment following the criteria of item 3.4 and 3.5.
   When deriving indirectly seasonally adjusted chain-linked Laspeyres(-type) aggregate series by aggregating seasonally adjusted chain-linked Laspeyres(-type) component series, the following steps need to be performed:
   1. seasonally adjust the chain-linked Laspeyres(-type) component series;
   2. 'un-chain' the seasonally adjusted Laspeyres(-type) component series (with respect to the chain-linking technique);
   3. aggregate the unchained seasonally adjusted Laspeyres(-type) component series;
   4. chain-link the resulting seasonally adjusted Laspeyres(-type) aggregate series (again, with respect to the chain-linking technique);
   5. re-reference the seasonally adjusted chain-linked Laspeyres(-type) aggregate series to the index reference year. In the presence of calendar effects, normalise the seasonally and calendar adjusted data to the calendar adjusted aggregate of the reference year, otherwise normalise the seasonally adjusted data to the unadjusted data of the reference year (e.g. 2005=100).

   When strong users' requirements justify it and unadjusted (or calendar adjusted) data are additive, force the annual total of the seasonally adjusted (or seasonally and calendar adjusted) data to be equal to the annual total of the unadjusted (or calendar adjusted) data. Finally, check for overall quality of the adjustment.

B) Perform seasonal adjustment directly on each individual annually chain-linked Laspeyres(-type) series with no specific consideration to temporal and sectoral/geographical consistency.

C) Seasonal adjustment is performed on unchained series (non-meaningful approach – strictly speaking, unchained series are not time series). Impose temporal, accounting or geographical constraints on chain-linked seasonal adjusted data.

(*) A) Best alternative; B) Acceptable; C) To be avoided

7. Data presentation issues

7.1. Data availability in databases

Description

Outputs from the seasonal adjustment process should be stored within a secure and usable database environment. The minimal output that should be stored is unadjusted and seasonally adjusted data using a time series nomenclature allowing users to associate the respective data, either by including a relevant dimension in or as a suffix to the raw data identifier. Additional output that could be stored include: calendar adjusted, trend-cycle data, seasonal factors, calendar factors, parameters/options for rerunning the process; prior corrections and prior versions (vintages). The database should be accessible for the purposes of re-producing; updating; and revising. The stored information should be consistent with any dissemination strategy and be accessible to users on request, respecting any confidentiality issues.

For a single time series, accessibility is measured as the number of available outputs, in the case that user requirements are not met the relevance dimension will fail. Clarity is measured qualitatively through producer satisfaction with seasonal adjustment settings, and quantitatively through the measures to support interpretation of outputs, for example Months (or Quarters) for Cyclical Dominance (MCD and QCD respectively) for trend movements in the seasonally adjusted series, standard errors for any single or combined component or real time data revisions.

The comparative quality of the accessibility of alternative approaches/strategies is measured as the difference in the number of relevant outputs available. Measures to compare clarity are the relative sizes of MCD (or QCD), standard errors (or even the existence of these) and revisions as these will directly impact the quality of user interpretation.

Options

- Storage and availability of additional time series output. For example, prior corrections, calendar adjusted data.
- Storage of all associated metadata information relating to an individual time series.
- Storage of data vintages to allow revision analysis.

Alternatives (*)

A) Systematic storage of unadjusted data, seasonally adjusted, seasonal adjustment options, prior corrections and trend-cycle data in a database with related nomenclatures. Ideally data vintages should be included. Metadata standards should be followed to ensure that all data can be exchanged easily and comply with the Metadata Template (see item 7.3). The database information should be secure but be accessible as required. The principles of ensuring transparency and enabling all users to understand and replicate the seasonal adjustment process should be followed.

B) Systematic storage of unadjusted and seasonally adjusted data with associated metadata identifier. Additional data and metadata required to replicate the process can be stored or documented. The information should be made available on request and should allow for replicating the seasonally adjusted figures.

C) No systematic storage of unadjusted and seasonally adjusted time series.

(*) A) Best alternative; B) Acceptable; C) To be avoided

7.2. Press releases

Description

Press releases aim to provide news and the figures on which policy is based. Data can typically be presented either as unadjusted or seasonally-adjusted. The unadjusted data contain all characteristics of the time series. The adjusted data contain the "news" of the series, i.e. the trend-cycle and the irregular component.

Much of the discussion on trend-cycle analysis focuses on the so-called end-point problem. Since the trend-cycle values at the end of the series are usually estimated by extrapolation, the estimated trend-cycle for the most recent data is very uncertain and can suffer from phase-shift problems. Particular care is required at turning points, where it is often months before the new correct direction of development appears. In all cases, the information contained within the press release should adhere to the principles of ensuring transparency and assisting users in making informed decisions.

Timeliness and punctuality are an issue for publication of a single time series if the time needed for seasonal adjustment delays data release.

Timeliness and punctuality will be an issue for alternative seasonal adjustment approaches/strategies only if either alternative impacts directly on the publication timetable. For example, validation of indirect adjustment might take longer than validation of direct adjustment. Further details on data presentation recommendations for press releases are available in the OECD Data and Metadata Reporting and Presentation Handbook, Chapter 5.

Options

- Include only unadjusted data in press releases.
- Extend the informative content of press releases with one or more of the following transformations: seasonally adjusted series; calendar adjusted series; trend-cycle series.
- Present only levels or different forms of growth rates.
- Include empirical revision errors for the seasonally adjusted and/or trend-cycle series.

Alternatives (*)

A) Seasonally adjusted data are the most appropriate figures to be presented in press releases. In addition, users should be provided with directions to the full historical unadjusted, calendar adjusted and trend-cycle time series, by reference and/or by internet download. When presenting trend-cycle estimates, the most recent values should not be shown because of the end-point problem or they should be accompanied by warnings related to their end-point problem. Analysis of real time revision errors of at least the seasonally adjusted estimates should be included.
Period-on-period growth rates and changes in level should be computed on seasonally adjusted data and used with caution if the time series has high volatility. Year-on-year comparisons should be computed on calendar adjusted or, in the case of absence of calendar effects, on unadjusted data.

B) Presentation of seasonally adjusted data and presentation of the trend-cycle in a graphical way which includes estimates for the current end of the series. In this case the end-point problem of the trend-cycle estimate should be made very clear. Year-on-year comparisons could be computed on seasonally adjusted data, in case of strong user demand. Annualised growth rates can also be used, especially for well justified reasons (e.g. for monetary aggregates). Particular attention has to be paid in cases of highly volatile series. Users should be informed of the specific characteristics of annualised growth rates.

C) Presentation of the unadjusted data only, for series with seasonal components, or trend-cycle data only, as well as the computation of early period to period growth rates on either the raw or trend-cycle data.

(*) A) Best alternative; B) Acceptable; C) To be avoided

7.3. Documenting metadata for seasonal adjustment

Description

It is important that seasonally adjusted data are appropriately documented using the SDMX structure. Seasonal adjustment metadata are essential for communication with users. Additionally they are very useful for the exchange of information between institutions, but also for monitoring the implementation of the ESS Guidelines on Seasonal Adjustment.

In SDMX the adjustment concept (Concept 3 of Annex 1 of the SDMX guidelines – "Cross-Domain Concepts") is defined as:
The set of procedures employed to modify statistical data to enable it to conform to national or international standards or to address data quality differences when compiling country specific data sets".

A seasonal adjustment metadata template should be designed to fulfil the requirement of the adjustment concept. It should record, in a standard form, the metadata on how seasonal adjustment is performed for different groups of series.

Both the SDMX structure and the seasonal adjustment metadata template should be reviewed regularly.

Options

- Use the SDMX structure.
- Use the seasonal adjustment metadata template.
- Use another metadata structure.
- Do not document metadata.

Alternatives (*)

A) Use the SDMX structure supplemented by the standard metadata template for seasonal adjustment for all groups of series. Update the information using both the SDMX and the seasonal adjustment metadata template regularly to reflect changes in the seasonal adjustment process.
B) Use only the SDMX structure, reviewed regularly.
C) Do not compile any standard metadata.

(*) A) Best alternative; B) Acceptable; C) To be avoided

HOW TO OBTAIN EU PUBLICATIONS

Free publications:

- one copy:
  via EU Bookshop (http://bookshop.europa.eu);
- more than one copy or posters/maps:
  from the European Union's representations (http://ec.europa.eu/represent_en.htm);
  from the delegations in non-EU countries (http://eeas.europa.eu/delegations/index_en.htm);
  by contacting the Europe Direct service (http://europa.eu/europedirect/index_en.htm) or calling 00 800 6 7 8 9 10 11 (freephone number from anywhere in the EU) (*).

  (*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

Priced publications:

- via EU Bookshop (http://bookshop.europa.eu).

KS-GQ-15-001-EN-N

Publications Office

doi:10.2785/317290