Using Demetra+

Instituto Nacional de Estatística — Statistics Portugal

Portuguese Official Statistics

National Accounts Department

Short Term Statistics Unit

Regina Soares

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Main purpose of seasonal adjustment

- Statistics are often influenced by seasonal fluctuations and other calendar/trading-day effects.

- The main aim of seasonal adjustment is to filter out usual seasonal fluctuations and typical calendar effects (number of working or trading days or holidays) within the movements of the time series.

- Decision maker will be interested to know if his results generally increase or decrease in order to adjust himself whenever the need, without considering a rise or fall that occurs regularly at one moment of the year.

Main purpose of seasonal adjustment

- To support the analysis excluding seasonality, the most widespread practice usually consists in breaking up the studied series in distinct components in order to better understand its evolution.

- Unusual movements that are readily understandable in economic terms (for example the consequences of economic policy, large scale orders or strikes) will continue to be visible.
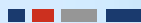
Seasonally adjust all series?

- Statistics of Portugal follow closely the ESS Guidelines

  - Seasonal adjustment must be performed **only** when there is a clear **statistical evidence and economic interpretation** of the seasonal/calendar effects.

- Before starting a large scale seasonal adjustment process, some series are identified as series that must not be seasonally adjusted and/or calendar adjusted, in order to avoid an inappropriate statistical treatment of series where there is no economic interpretation and/or do not show any evidence of such effects .

Seasonally adjust all series?

- From ESS Guidelines:

- "It must be clearly stated that some series can be only characterized by calendar effects without seasonal ones. In this case only the calendar adjustment will be appropriate."

- "Furthermore other series can be characterized only by seasonal effects without significant calendar ones; in this case only the seasonal adjustment filtering must be applied."

- "Inappropriate or low-quality seasonal adjustment can generate misleading results and increase the probability of false signals (credibility effects)."

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The seasonal adjustment process

- **Current adjustment:**

  – The model, filters, outliers and regression parameters are re-identified and the respective parameters and factors re-estimated once a year or whenever significant revisions occur.

  – The seasonal and calendar factors are forecasted and these forecasts are used until the next revision of raw data.

- This option minimizes the frequency of revisions, that are concentrated mostly during the month of March (April).

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The seasonal adjustment process

- Indirect seasonal adjustment :

- All time series are seasonally adjusted on an individual basis - **NACE3 Level**

- Seasonal and calendar adjusted aggregates are obtained as a weighted sum (the same weights used to aggregate the raw series).
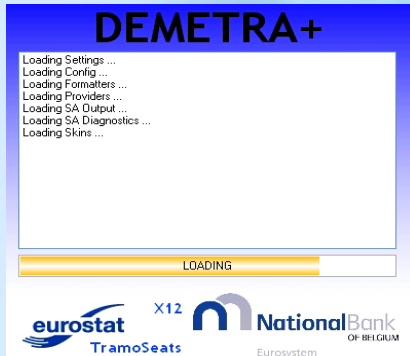

The seasonal adjustment process - Methods and Tools

- The approach used for seasonal adjustment is mostly the model-based one, with TRAMO-SEATS in Demetra+.

- For some series, due to their characteristics, we prefer X12ARIMA.

- Since January we are testing the use of Demetra+, a tool for Seasonal Adjustment developed by National Bank of Belgium for EUROSTAT.

Why to use DEMETRA+

DEMETRA+

Loading Settings ...
Loading Config ...
Loading Formatters ...
Loading Providers ...
Loading SA Output ...
Loading SA Diagnostics ...
Loading Skins ...

LOADING

eurostat X12 National Bank
TramoSeats OF BELGIUM
Eurosystem

➢ User friendly!!!

➢ It will be Open-Source (java)

➢ Based on X12 ARIMA and Tramo-Seats

- TramoSeats is a model-based seasonal adjustment method developed by Victor Gomez and Agustin Maravall (Bank of Spain).

- X-12-ARIMA is a seasonal adjustment program developed by the US Census Bureau.

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Steps to perform seasonal adjustment

1. Import of the row data from production database

2. Graphical analysis of the raw data

3. Defining and adjusting for calendar effects

4. Select the regressors

5. Seasonally adjust single series or running a multiprocessing

6. Quality control of the seasonal adjustment

    1. Analysis of the results

    2. Change of the specifications

    3. Adding the results to the workspace and saving them

7. Export the results and the details of the models

8. Documentation of the process.

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1 - IMPORT DATA

- The production database for Short Term Statistics exports the raw data in csv format.

- After the analyses/correction of the raw data for revisions purposes, the data is imported into Demetra+ in order to initiate the procedures for seasonal adjustment.

- Demetra+ provides an easy process for importing data from several types of files.

Easy to import data into Demetra+

Ex: Open an Excel file

1. Click on the **Excel** tab of the *Browsers* panel;
2. Click on the button on the left to **Add** a workbook;
3. **Choose** an Excel workbook from your folders
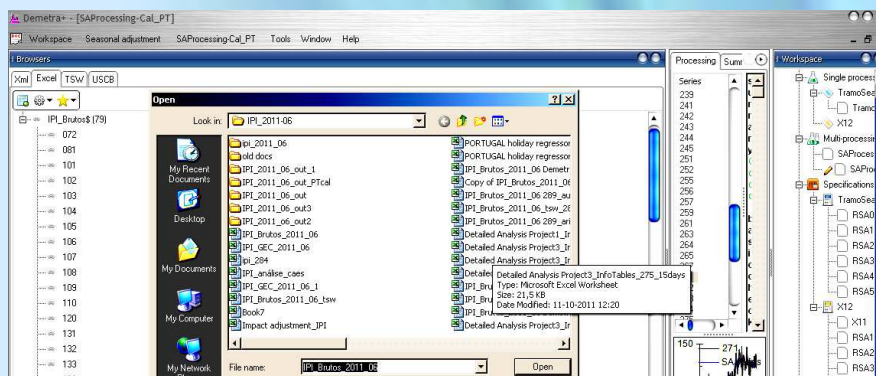
2 - Graphical Analysis

- Graphical analysis is an important step of the seasonal adjustment procedure.

- *Visual analysis of time series is often very helpful.*

- *It can help to identify the possible **outliers**, **missing values**, changes in the seasonal behaviour, presence of **seasonality**, **breaks** in the seasonality or trend of the time series. ....*

Check the original series – Graphical Analysis

TS Properties
Name : KZ   Source : XCLPRVDR

Statistics
- Time span: 1-2000 to 6-2010
- Number of observations: 126
- Number of missing values: 0
- Min: 56.6
- Max: 139.6
- Average: 95.850794
- Median: 98.35
- Stdev: 19.5116316388812
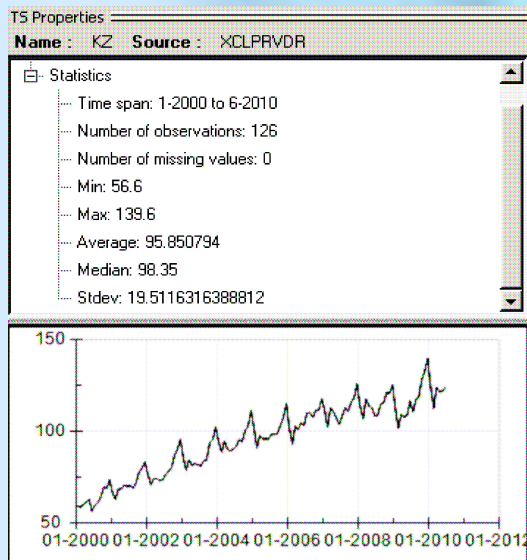
- In the *TS Properties* panel **click once on the name of the series** in the *Browsers* panel you will see

  - The Graphic of **original time series**

  - **Basic Properties** (number of missing values, average, standard deviation...)

Graphical Analysis

- Demetra+ has very helpful graphics and easy to use:

- Select **Tools/Container/Chart** or other forms of presenting the data, such as a growth chart or a grid.

- Add a time series by **dragging and dropping** it from the *Browsers* panel or from the *Grid.*

Graphical Analysis

It may seem time consuming, but it can help (save time) for the step of pre-treatment of the series.
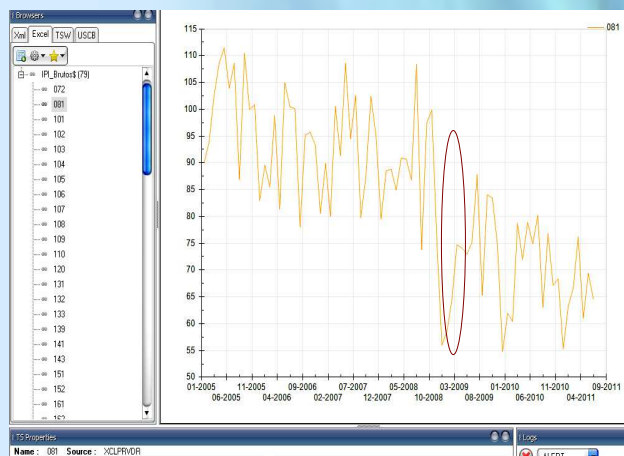
After

Choose **Tools/ Spectral Analysis/ Periodogram**.
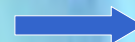
Graphical analysis
Periodogram and an Auto-regressive spectrum

- In the plots, **seasonal** frequencies are marked as **grey vertical lines**, while the **purple lines** correspond to **trading day** frequencies.

- Peaks at the seasonal or trading day frequencies indicate the presence of seasonality or trading day effects

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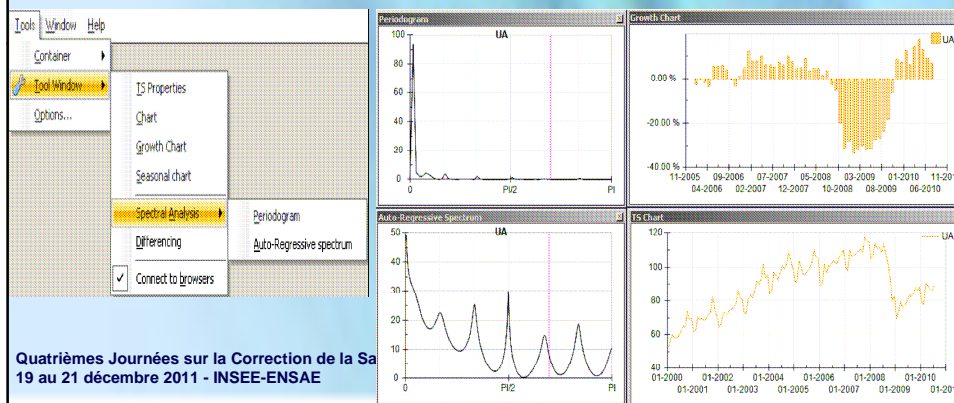
3 - Defining and adjusting for calendar effects

- Calendar effects that can affect the economic activity:

  - The different number of working days in a specific month or period

  - The composition of working days (number of Mondays, Tuesdays, etc/number of working days and weekend days)

  - The leap year effect

  - The moving holidays (ex: Easter, Ramadan, etc.)

- For the moment Demetra+ doesn't include national calendars, but it is very easy to define it.

- Depending of the activity a different set of regressors is defined for calendar adjustment.

- EX: For IPI the choice is 2 regressors (number of working days and leap year) and for Retail Trade Turnover we use 7 regressors (number of Mondays, Tuesdays, etc and leap year effect)

Defining and adjusting for *calendar effects*
1. Choice of the regressors for calendar adjustment

- In the *Workspace* panel, you can choose between the **seasonal adjustment methods**.
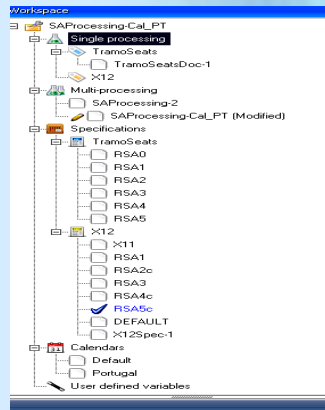
National Calendars
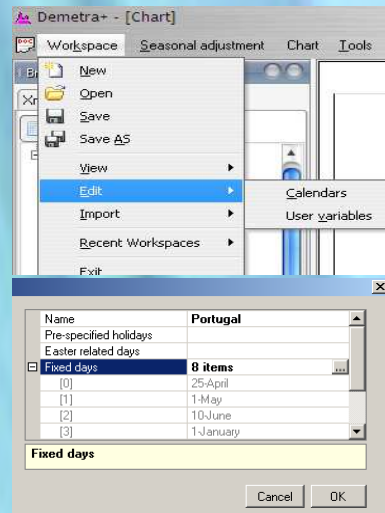
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4 - Selection of the method and regressors

- Demetra+ has **predefined specifications** for the decomposition scheme.

- If we are doing an exploratory run for a single series or a multiprocessing, we use these options for the decomposition of the series.

- When selecting the method and the regressors, we are taking decisions about how to do the pre-treatment of the series (outliers, moving holidays, working and trading days) and how to identify the seasonal model.

4 - Selection of the method and regressors

- During the detailed analysis, very often, it is necessary to change the specifications (pre-define outliers, models with too many outliers or parameters, impact of the adjustment on the growth rates...)

- Short time series should be adjusted with few regressors.

- Long time series may require more regressors.

- In general, instability of seasonal adjustment could arise for very long time series (breaks on the series, changes on the seasonal pattern...).

Select regressors

- Choose the specification by **right clicking on the option**, and **select active** from the menu under **TramoSeats**.

Predefined specifications in TRAMO/SEATS
Name Explanation

RSA0 level,airline model

RSA1 log/level,outliers detection, airline model

RSA2 log/level, working days, Easter, outlier detection, airline model

RSA3 log/level, outlier detection, automatic model identification

RSA4 log/level, working days, Easter, outlier detection, automatic model identification

RSA5 log/level, trading days, Easter, outlier detection, automatic model identification
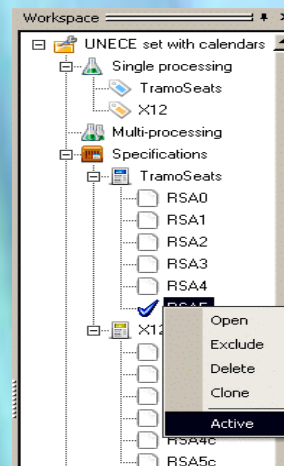
Select regressors

- The same way, you can choose the specification under **X12ARIMA**.

Predefined specifications in X12ARIMA

Name Explanation

X11 No pre-processing

RSA1 log/level,outliers detection, airline model

RSA2c log/level, working days, Easter, outlier detection, airline model.
Pre-adjustment for leap-year if logarithmic transformation has been used

RSA3 log/level, outlier detection, automatic model identification

RSA4c log/level, working days, Easter, outlier detection, automatic model identification. Pre-adjustment for leap-year if logarithmic transformation has been used

RSA5 log/level, trading days, Easter, outlier detection, automatic model identification. Pre-adjustment for leap-year if logarithmic transformation has been used.

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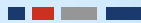
5 - Seasonally Adjust

- We start the analysis with the default specifications as shown in the *Workspace* or using a *previously saved Workspace (current or concurrent adjustment).*

- *By dividing the series into its parts*, seasonal adjustment aims to filter out usual seasonal fluctuations and typical calendar effects within the movements of the time series under review.

- The seasonal adjusted series shows the "news" contained in the time series allowing a clearer understanding of the economic evolution.

Seasonally adjust

- Demetra+ performs the **decomposition of the series** - seasonal, trend and irregular component.
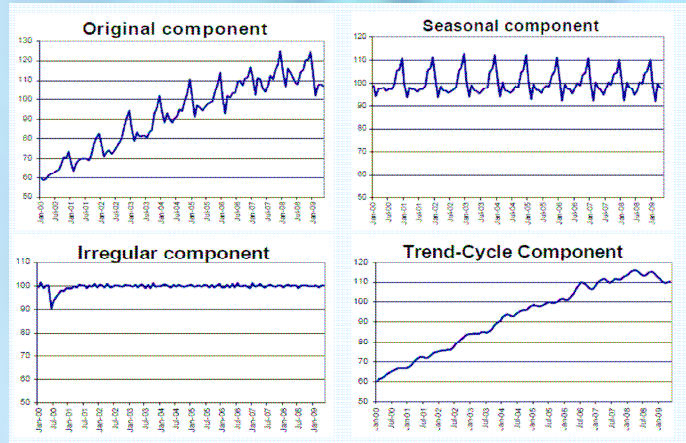
O QuickTime™ e um descompressor são necessários para ver esta imagem.

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Adjust a single series

By a double click on a series in the *Browser panel also we can launch the adjustment.*

We can choose different specifications for a difficult series and compare the models.

Adjust several series

- Create a new **multi-processing** window, through the main menu **Seasonal adjustment/Multi-processing/New**.

- First, choose your **specification of regressors**

- Second, **drag and drop** the series you want to process.

- Third, **select SAProcessing-xx/Run** from the main menu.
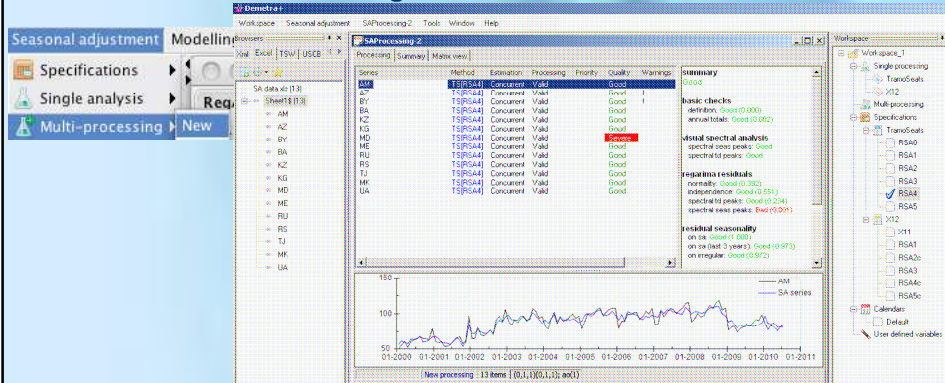
Results of an explanatory first run

- For each series we have information about the validity of the processing, the general quality and identification of series with some problems.
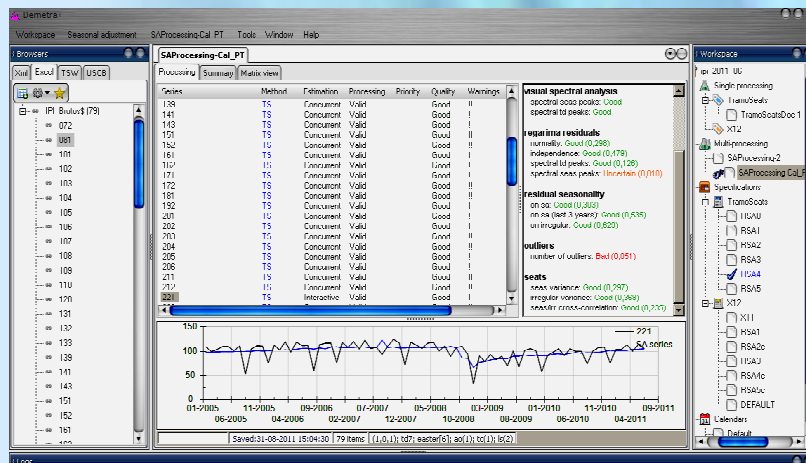
6 - Quality control

- Seasonal adjustment is a complex statistical data treatment which needs close observation before the results are accepted.

- To ensure good quality of seasonal adjustment the results must be validated through a wide range of quality measures, that are available on Demetra+.

- Among others, we must assess the absence of residual seasonality and calendar effects and the stability of the seasonally adjusted series.

- An important issue is to check if the number of outliers is small and if they are not concentrated around the same period of the year.

- Also important is to check the impact of the calendar effects on the level and growth rates of the series.
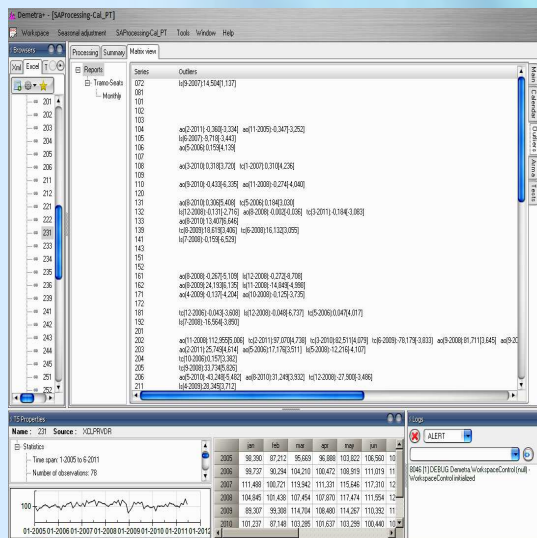
Matrix View

- Matrix view contains information of:

- The regressors for calendar adjustment

- The outliers identified

- The ARIMA model

- The results of the quality tests

Detailed analysis

The summary diagnostics under Main results gives a first indication of the overall quality of adjustment.
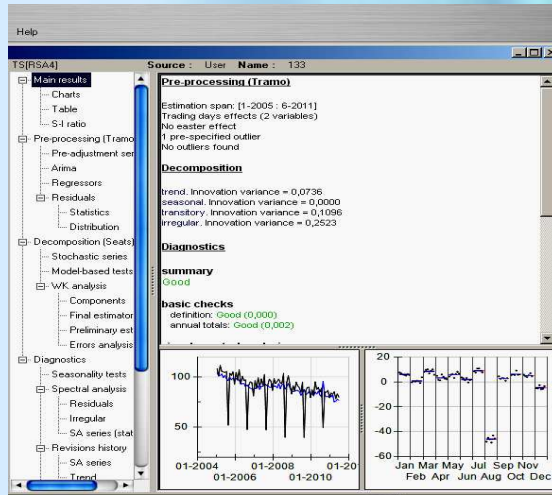
- By clicking on one series we can access more detailed information.
- A panel opens, which includes information:
- Main results
- Pre-processing (TRAMO)
- Decomposition (SEATS)
- Diagnostics.

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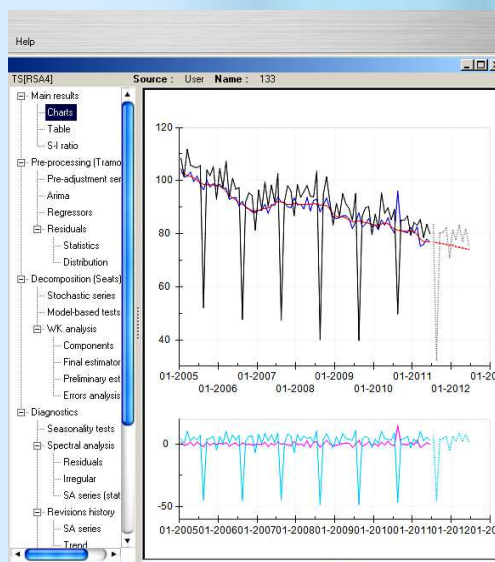
Charts

- Under *Charts* you will find the **basic results** including:
- Original series(in **black**)
- Seasonally adjusted series (in **blue**)
- Trend (in **red**)
- Seasonal factor (in **light blue**)
- Irregular component (in **rose**)

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Main results

- *The Results panel includes details about pre-processing and decomposition.*

- **Pre-processing** shows the estimation span used, log transformation, corrections for trading days, Easter and outliers.

- **Type of applied ARIMA model**, regressors and the dates and types of outliers.

- Demetra+ analyses the **distribution of residuals** and offers several other tests on them.

Decomposition Model

- The result series are displayed under the **Stochastic series**.

- To test the validity of decomposition, Demetra+ offers some **Model-based tests** (you can see if there is any cross-correlation between the components of the series, for the components which should be independent).

- **Wiener-Kolmogorov analysis** includes many advanced visual tools for analysing the decomposition.

Quality diagnostics

- Quality diagnostics **include** seasonality tests, spectral analysis, revision history, sliding spans and model stability.

- Diagnostics page presents summary results on the **residual seasonality** in order to reveal remaining seasonality in the seasonally adjusted series and the irregular component;

- Shows the number of **outliers**;

- Summary statistics on the **seasonal variance** of the series;

- **Revision history** for visually **assessing the stability** of the seasonally adjusted and the trend series

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Refine and readjust

- You can **change the specifications** easily i.e. from five regressors (RSA5) to four (RSA4) by dragging and dropping it from the Workspace panel.

- In multiprocessing, you can **modify the specification**, apply the new specification and save the results.

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Adding the results to workspace and saving them
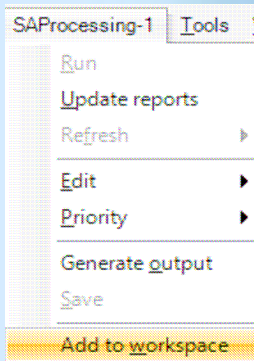
• You must first add them to the workspace by the main menu **TramoSeatsDoc-xx/Add to Workspace**.

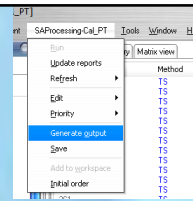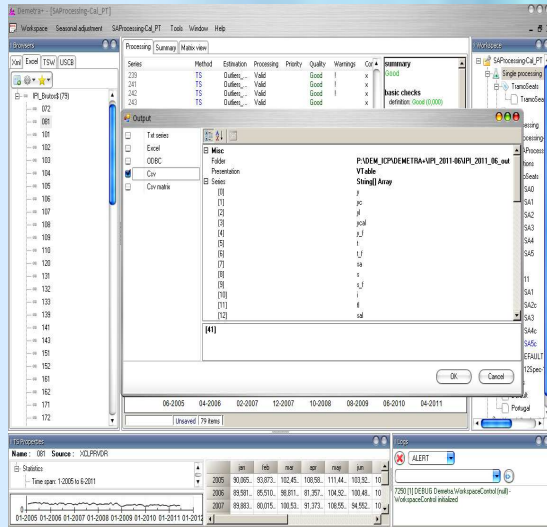• Only then you can save the workspace by **Save/Save as**.
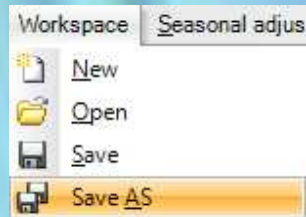
When you reopen Demetra+, it will include the last workspace in the **Main Menu/Workspace**

Adding the results to workspace and saving them

At the main menu, you can start a second adjustment of these data by selecting **SAProcessing-x / Refresh**
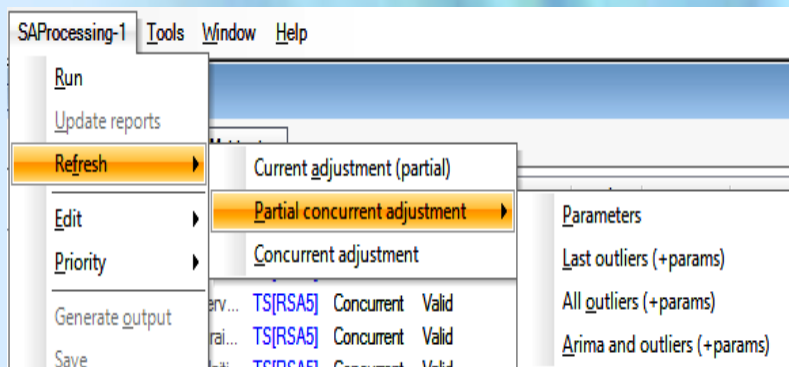
## Export the results and the details of the models

- The user can export the results of seasonal adjustment **to other devices.**

- From the Main menu, select SAProcessing-xxx/**Generate output**. Demetra+ will save the Excel and csv files.

- For the results of the **forecasted components,** the format available is CSV.

Export data

- By choosing the option CSV matrix we will have available the information about the models, the quality tests and diagnostics.

- This matrix will be part of our documentation, to consult in future refreshments of data and/or models.
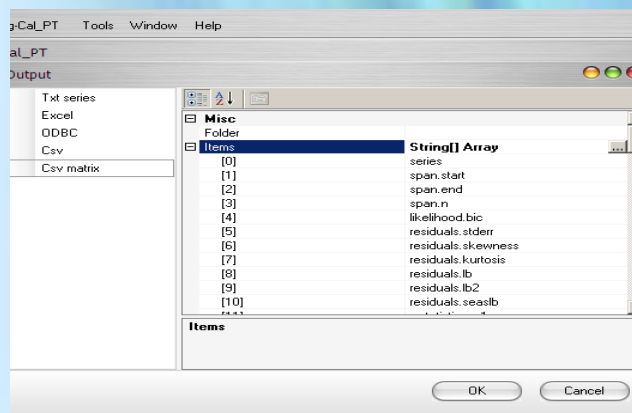
8 - Documentation of the process

- It is important to store in a safe place the information about the methods and decisions taken in the seasonal adjustment process, together with the generated outputs and saved workspaces

- This will ensure transparency about the procedures and enables the experts to understand and, if necessary, replicate the seasonal adjustment.

- These documents are very useful for future revisions, since they provide us with the necessary information for the next adjustment.

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8 - Documentation of the process

Nome	Data de alteração
demetra_cal_f.csv	11/12/07, 11:12
demetra_cal.csv	11/12/07, 11:12
demetra_det_f.csv	11/12/07, 11:12
demetra_det_i_f.csv	11/12/07, 11:12
demetra_det_i.csv	11/12/07, 11:12
demetra_det_s_f.csv	11/12/07, 11:12
demetra_det_s.csv	11/12/07, 11:12
demetra_det_sa_f.csv	11/12/07, 11:12
demetra_det_sa.csv	11/12/07, 11:12
demetra_det_t_f.csv	11/12/07, 11:12
demetra_det_t.csv	11/12/07, 11:12
demetra_det_y_f.csv	11/12/07, 11:12
demetra_det_y.csv	11/12/07, 11:12
demetra_det.csv	11/12/07, 11:12
demetra_i.csv	11/12/07, 11:12
demetra_il.csv	11/12/07, 11:12
demetra_m.csv	11/12/07, 11:16
demetra_mh_f.csv	11/12/07, 11:12
demetra_mh.csv	11/12/07, 11:12
demetra_out_i.csv	11/12/07, 11:12
demetra_out_s.csv	11/12/07, 11:12
demetra_out_t.csv	11/12/07, 11:12
demetra_out.csv	11/12/07, 11:12
demetra_reg_f.csv	11/12/07, 11:12
demetra_reg_i_f.csv	11/12/07, 11:12
demetra_reg_i.csv	11/12/07, 11:12
demetra_reg_s_f.csv	11/12/07, 11:12
demetra_reg_s.csv	11/12/07, 11:12
demetra_reg_sa_f.csv	11/12/07, 11:12
demetra_reg_sa.csv	11/12/07, 11:12
demetra_reg_t.csv	11/12/07, 11:12
demetra_reg_t_f.csv	11/12/07, 11:12
demetra_reg_y_f.csv	11/12/07, 11:12
demetra_reg_y.csv	11/12/07, 11:12
demetra_reg.csv	11/12/07, 11:12
demetra_s_f.csv	11/12/07, 11:12
demetra_s.csv	11/12/07, 11:12
demetra_sa.csv	11/12/07, 11:12
demetra_sal.csv	11/12/07, 11:12
demetra_sl.csv	11/12/07, 11:12
demetra_t_f.csv	11/12/07, 11:12
demetra_t.csv	11/12/07, 11:12
demetra_td_f.csv	11/12/07, 11:12
demetra_td.csv	11/12/07, 11:12

- We keep all series generated during the process of seasonal adjustment with Demetra+:

  – Raw data, seasonally adjusted data, calendar adjusted data, trend-cycle data, seasonal factors, Easter factor, calendar factor, outlier...

- The seasonal and calendar effect factors are exported for the production database, after monitoring the behaviour of seasonally and calendar effect adjusted data.
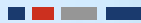
METADATA

- Unfortunately Demetra+ doesn't have a general report of a multi-processing similar to the one that existed on Demetra2.

- However we can copy the information of the summary statistics of the Results panel, i.e. the first page of Main results, Pre-processing, Decomposition and Diagnostics.

- This is very time consuming, but may be useful for the most important series.

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METADATA

- The csv Matrix contains useful information for metadada purposes:

Identification of each series	
start	independence
end	spectral td peaks
number of observations	spectral seas peaks
bic	on sa
stderr	on sa (last 3 years)
skewness	on irregular
kurtosis	seas variance
m statistics	irregular variance
q statistics	seas/irr cross-correlation
quality	Transformation of the series
annual totals	Model parameters
spectral seas peaks	Leap Year
spectral td peaks	Trading Days
normality	Outliers

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METADATA - CSV MATRIX

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Press releases

- For most Short Term Statistics press releases, we provide:
  - The raw data that contains all characteristics of the time series
  - The seasonally adjusted data provides an indication of the change in the economy (if the underlying series is not too volatile)
  - The calendar-adjusted series.

- Also the percentage of change from the previous month and the change from the same month one year earlier is published.

- Trend data is not available in the press releases, as the end of the trend series is very unstable and changes with new data (revised data or new observations)

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Thank you for your attention

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