Seasonal Adjustment with JDemetra+ (Intro)
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by
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*The views expressed are the author's alone and do not necessarily correspond to those of the corresponding organisations of affiliation

Outline

1. Time Series Analysis & Seasonality

2. Calendar Effects and Outliers

3. Decomposition, X-13 ARIMA vs. Tramo/Seats, ESS guidelines on SA

4. Step by step procedures for SA, JDemetra+

What is a Time Series?

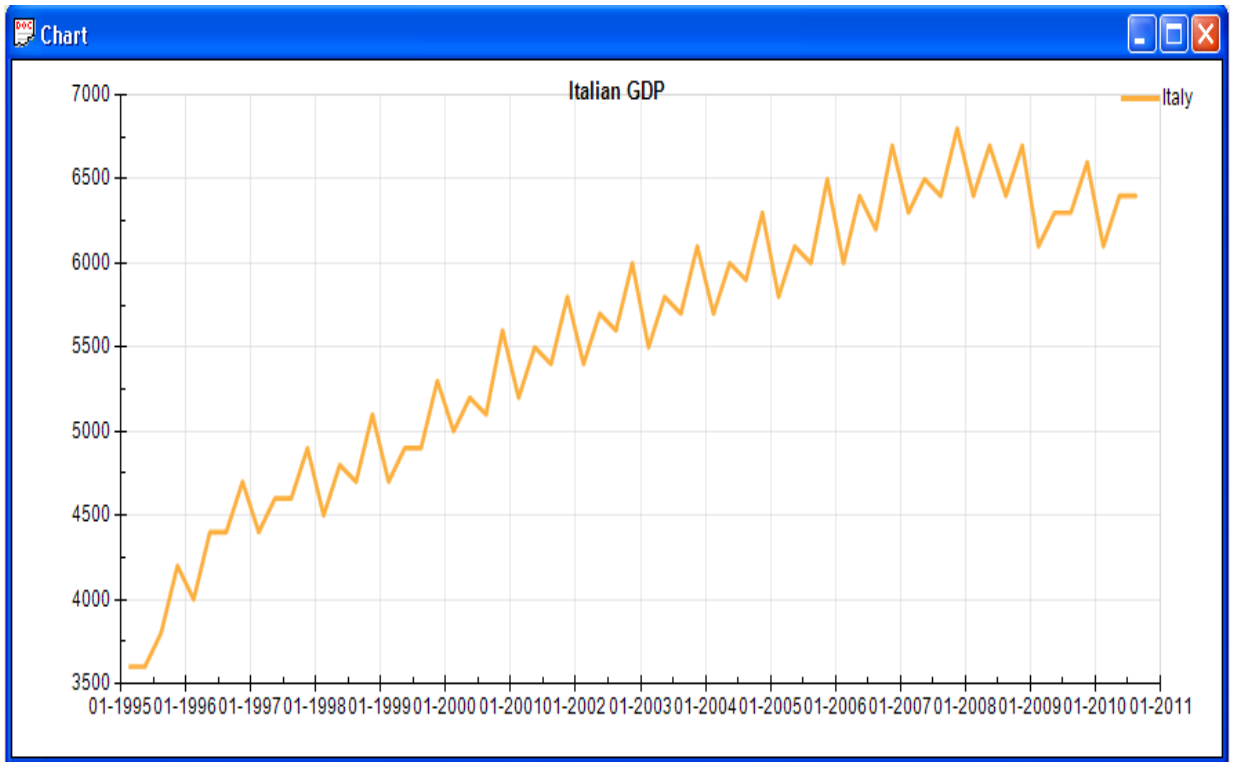
- A Time Series is a sequence of measures of a given phenomenon taken at **regular time intervals** such as hourly, daily, weekly, monthly, quarterly, annually, or every so many years

What is a Time Series?

Italian GDP – Quarterly data

Grid

	Italy
I-1995	3600
II-1995	3600
III-1995	3800
IV-19...	4200
I-1996	4000
II-1996	4400
III-1996	4400
IV-19...	4700
I-1997	4400
II-1997	4600
III-1997	4600
IV-19...	4900
I-1998	4500
II-1998	4800
III-1998	4700
IV-19...	5100
I-1999	4700
II-1999	4900



What is a Time Series?

Is this a Time Series?

2008				2009			
Q1	Q2	M8	Q4	Q1	Q2	Q3	Q4
100	200	30	250	90	120	100	190

What is a Time Series?

Is this a Time Series?

2008				2009			
Q1	Q2	M8	Q4	Q1	Q2	Q3	Q4
100	200	30	250	90	120	100	190

Look at the kind of data!!!

What is a Time Series?

Is this a Time Series?

2008				2009			
Q1	Q2		Q4	Q1	Q2	Q3	Q4
100	200		250	90	120	100	190

Usual Components

- **Trend/Cycle** *the long term evolution of the series*
- **Seasonal** (Seasonality) is the f*luctuations observed during the year and which appear to repeat themselves on a more or less regular basis from one year to other*
- **Calendar** Effect: *Any economic effect which appears to be related to the calendar (e.g. one more Sunday in the month can affect the production)*

Other Components

- **Irregular** Component *is composed of residual and random fluctuations that cannot be attributed to the other "systematic" components*
- **Outliers**

Cause of Seasonality

- **Seasonality and Climate**: due to the variations of the weather and of the climate (seasons!)
  - Examples: agriculture, consumption of electricity (heating)
- **Seasonality and Institutions**: due to the social habits and practices or to the administrative rules
  - Examples: effect of Christmas on the retail trade, of the fiscal year on some financial variables, of the academic calendar
- **Indirect Seasonality**: due to the Seasonality that affects other sectors
  - Examples: toy industry is affected a long time before Christmas.

Why Seasonal Adjustment?

- Business cycle analysis
- To improve comparability:
  - **<u>Over time</u>:**
    - Example: how to compare the first quarter (with February) to the fourth quarter (with Christmas)?
  - **<u>Across space</u>:**
    - Never forget that while we are freezing at work, Australians are burning on the beach!
    - Very important to compare European national economies (convergence of business cycles) or sectors

What are Seasonal and Calendar Adjustment?

SEASONAL ADJUSTMENT

Remove Seasonality

Seasonality:

Fluctuations observed during the year (each month, each quarter) and which appear to repeat themselves on a more or less regular basis from one year to the other

CALENDAR ADJUSTMENT

Remove Calendar Effects

Calendar Effects:

Any economic effect which appears to be related to the calendar (one more Sunday in the month can affect production)

Seasonal Adjustment

- The basic goal of Seasonal Adjustment is to decompose a Time Series into several different components, including a Seasonal Component and an Irregular Component
- Seasonal Adjustment is the process of **estimating and removing the Seasonal Effects** from a Time Series, and by Seasonal we mean an effect that happens at the same time and with the same magnitude and direction every year
- Because the Seasonal effects are an unwanted feature of the Time Series, Seasonal Adjustment can be thought of as focused **noise reduction**

Calendar Adjustment

- Calendar Effects typically include:
  - Different number of Working Days in a specific period
  - Composition of Working Days
  - Leap Year effect
  - Moving Holidays (Easter, Ramadan, etc.)

Irregular Component

- The Irregular Component is the remaining component of the series **after the Seasonal and Trend Components have been removed** from the original data
- For this reason, it is also sometimes referred to as the Residual Component. It attempts to capture the remaining short term fluctuations in the series which are neither systematic nor predictable

Data requirements

- **The data must be collected at a frequency less than annually** (e.g. monthly or quarterly

- For the data to be useful for Time Series analysis, the **definition** of the concept and the way it is measured should be consistent over time

Data treatment

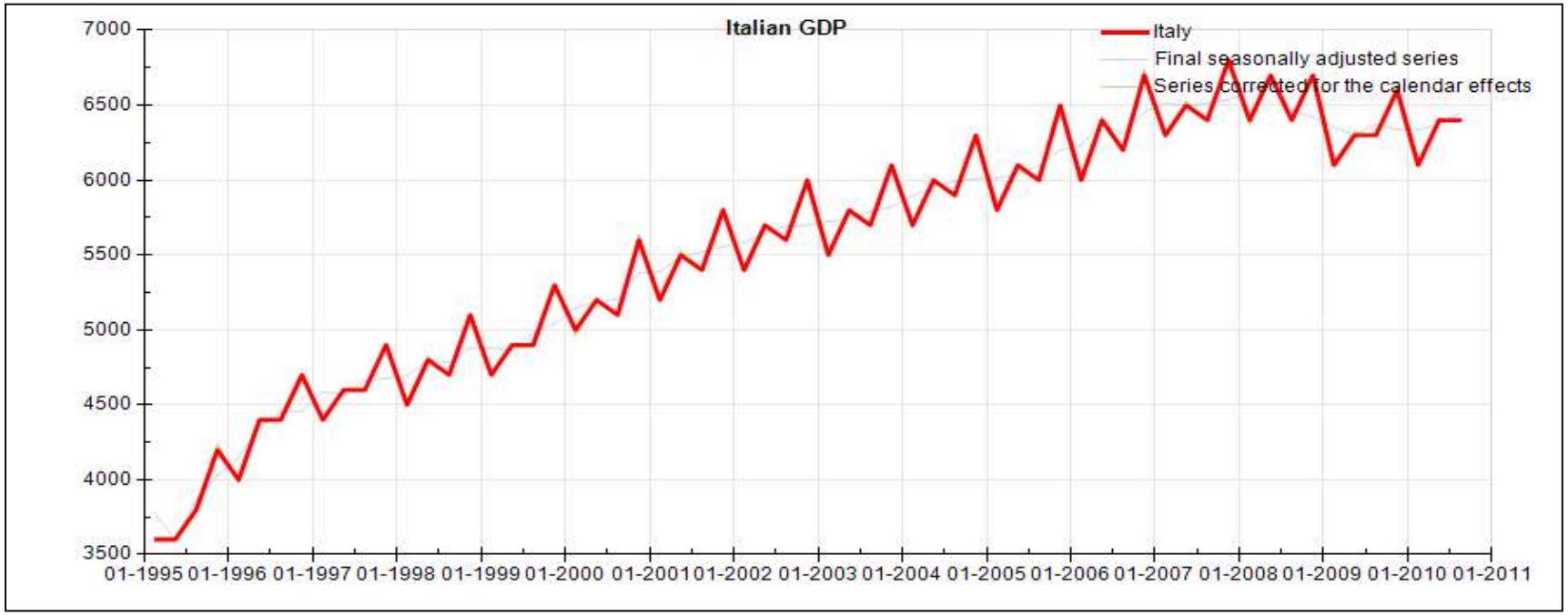
- One common **misconception** is that Seasonal Adjustment will also hide any **Outliers** present. This is not the case. If there is some kind of unusual event, we need that information for analysis, and Outliers are included in the Seasonally Adjusted series

Time Span

- Keep in mind that **longer series are NOT necessarily better**. If the series has changed the way the data is measured or defined, it might be better to cut off the early part of the series to keep the series as homogeneous as possible
- The best way **to decide if your series needs to be shortened** is to investigate the data collection methods and the economic factors associated with your series and choose a length that gives you the most homogeneous series possible

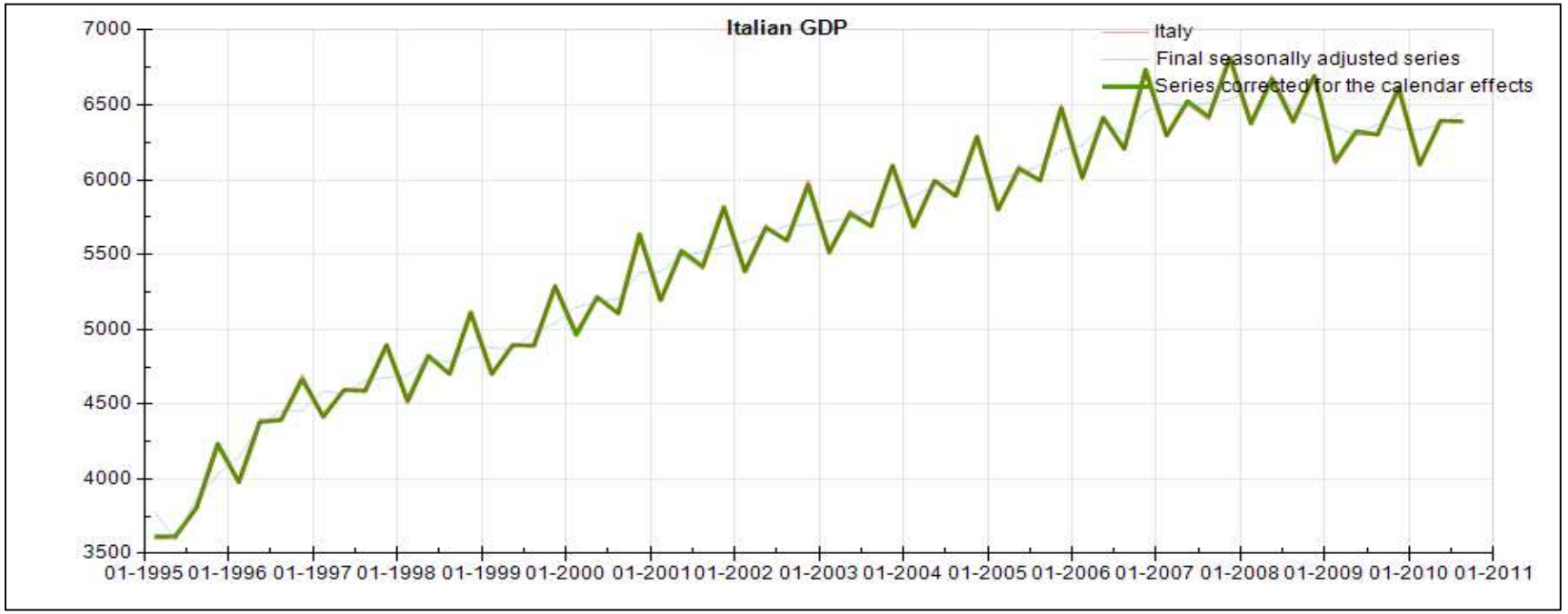
What happens after SA?

Original Series



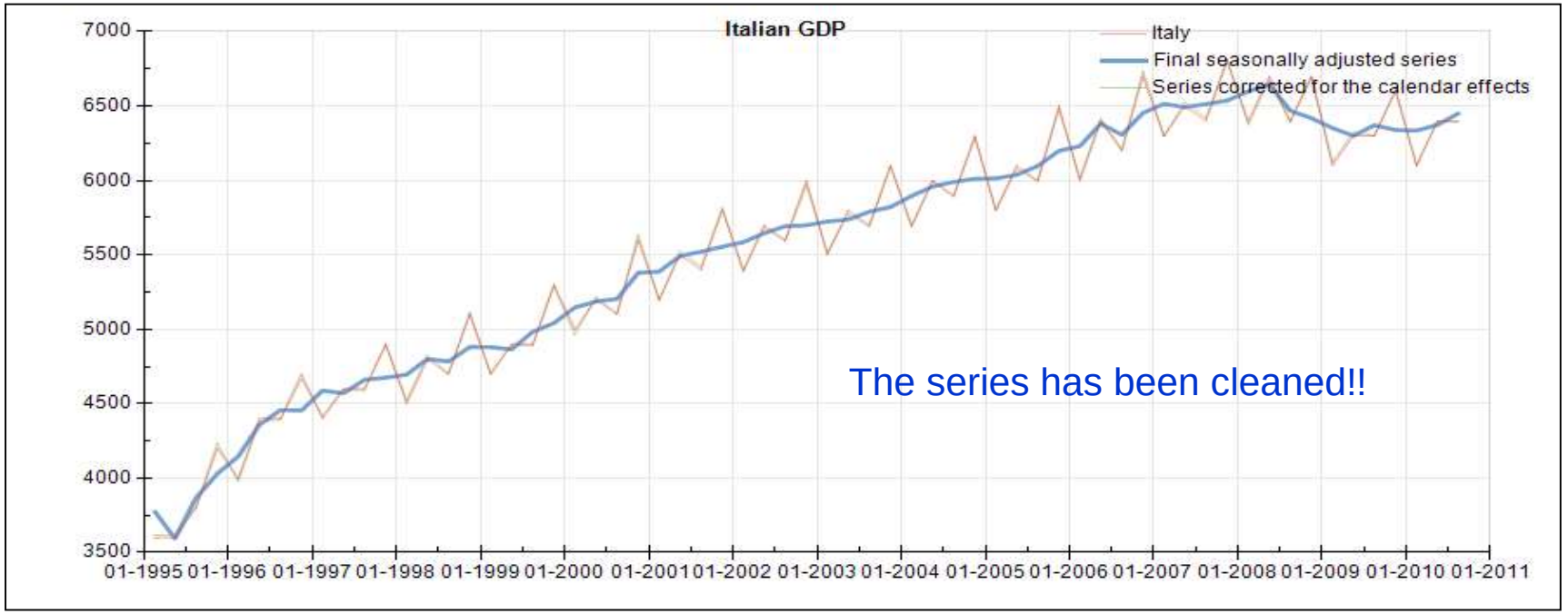
What happens after SA?

Calendar Adjusted Series



What happens after SA?

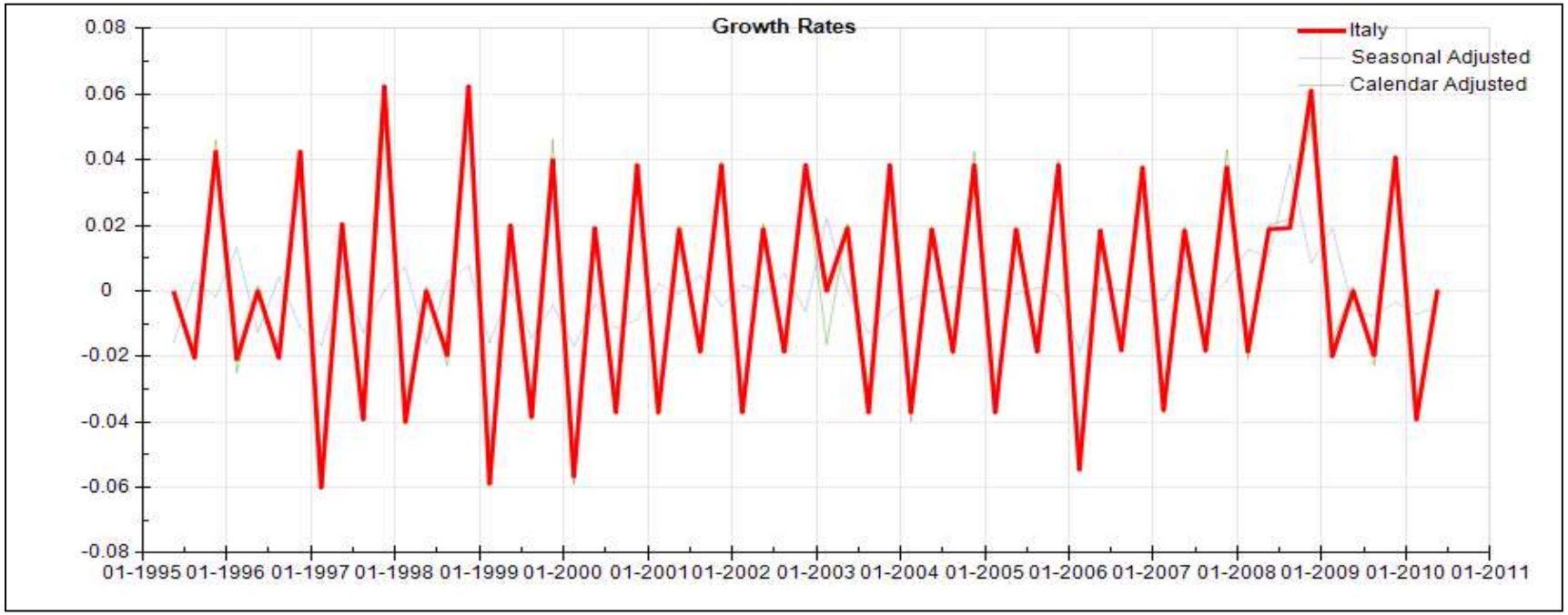
Seasonally Adjusted series



What happens after SA?

Original Series

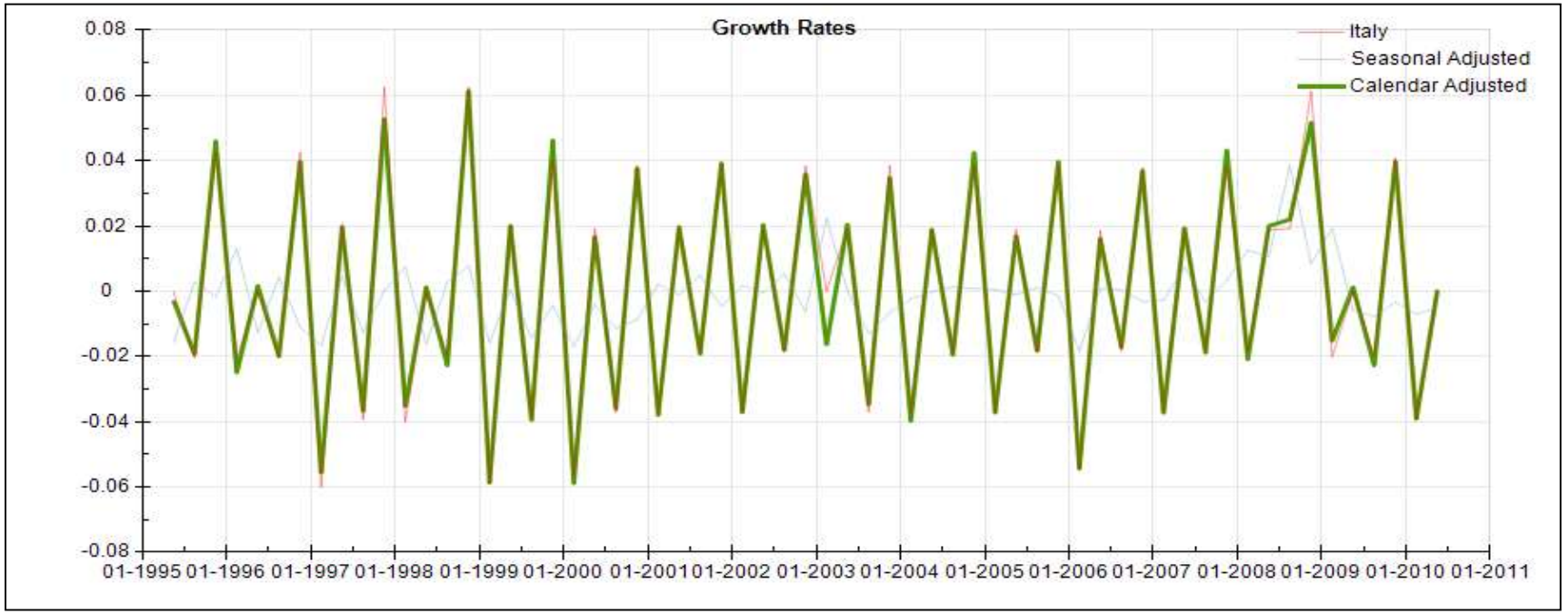
Growth Rates



What happens after SA?

Calendar Adjusted Series

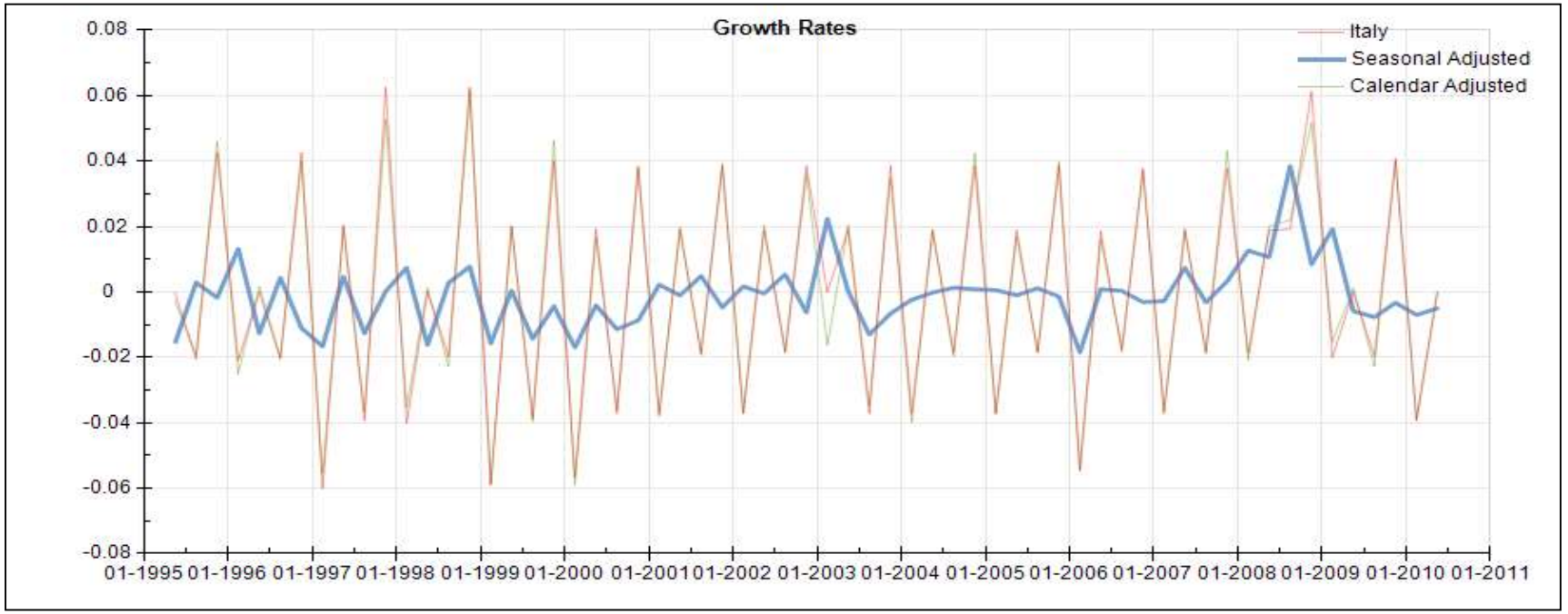
Growth Rates



What happens after SA?

Seasonally Adjusted series

Growth Rates



Some questions for you….

Why doing seasonal adjustment?

Which kind of data you can seasonally adjust?

Focus on

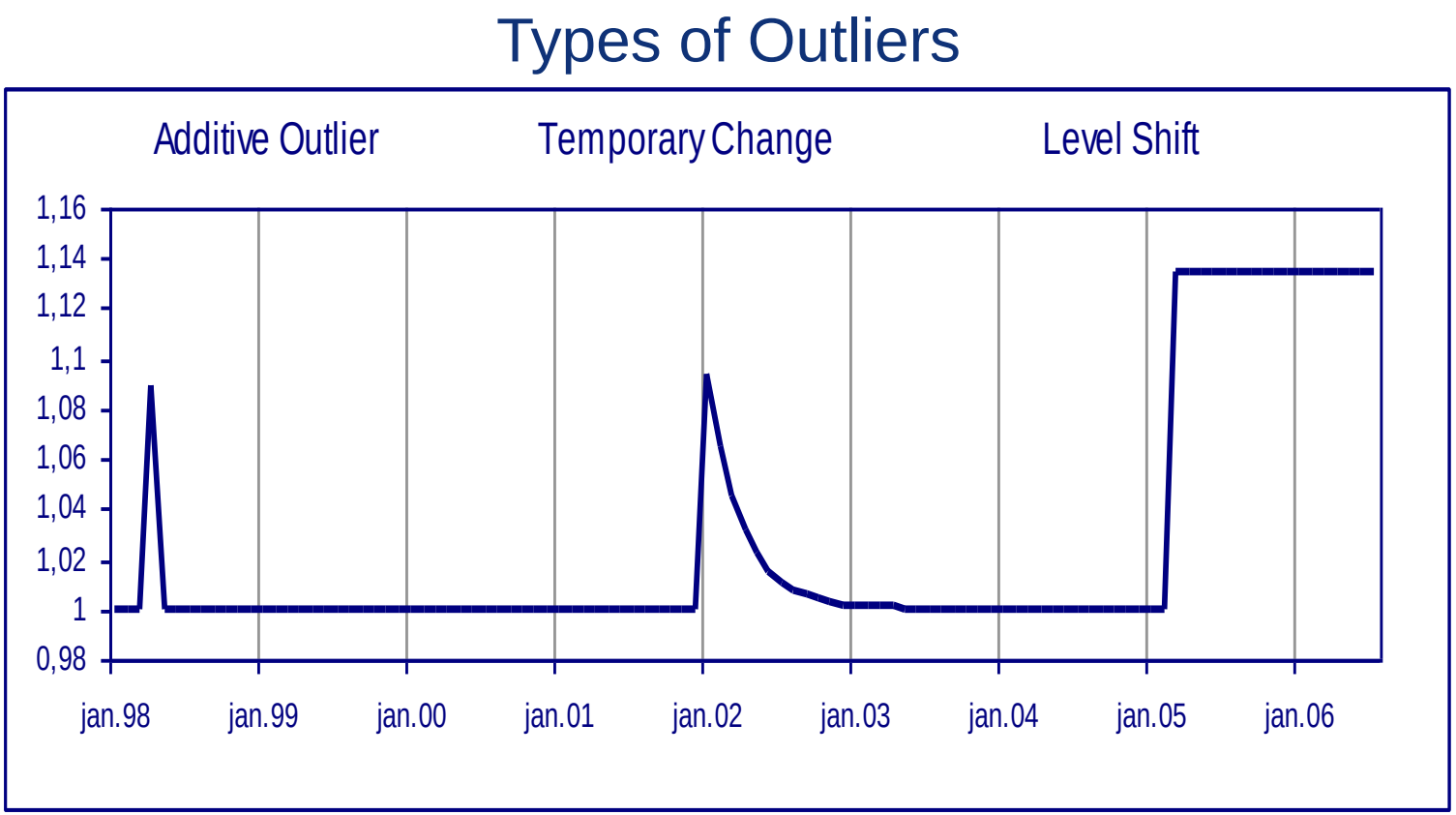
- Identification of types of Outliers
  - Additive outlier
  - Transitory change
  - Level shift
- Calendar Effect and its determinants
  - Trading days
  - Moving holidays

Outliers

Outliers are data which do not fit in the tendency of the Time Series observed, which fall outside the range expected on the basis of the typical pattern of the Trend and Seasonal Components

- **Additive Outlier (AO)**: the value of only one observation is affected. AO may either be caused by random effects or due to an identifiable cause as a strike, bad weather or war
- **Temporary Change (TC)**: the value of one observation is extremely high or low, then the size of the deviation reduces gradually (exponentially) in the course of the subsequent observations until the Time Series returns to the initial level
- **Level Shift (LS)**: starting from a given time period, the level of the Time Series undergoes a permanent change. Causes could include: change in concepts and definitions of the survey population, in the collection method, in the economic behavior, in the legislation or in the social traditions

Outliers

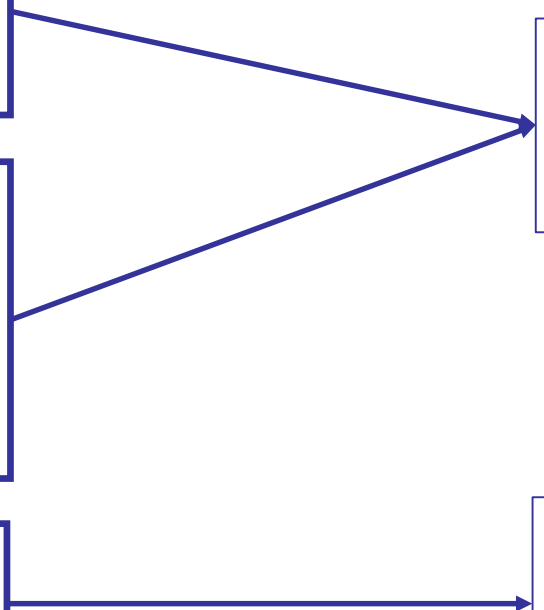

Types of Outliers
Additive Outlier
Temporary Change
Level Shift
1,16
1,14
1,12
1,1
1,08
1,06
1,04
1,02
1
0,98
jan.98
jan.99
jan.00
jan.01
jan.02
jan.03
jan.04
jan.05
jan.06

Outliers

Additive Outliers:
Unusual high or low singular values in the data series

Transitory Changes:
Transitory changes in the trend, followed by slow comebacks to the initial tendency

Level Shift:
Clear changes of the trend



Assimilated to the Irregular Component

Assimilated to the Trend Component

Outliers

- The smoothness of series **can be decided by statisticians** and the policy must be defined in advance
- Consult the users
- This choice can influence dramatically the credibility
- Outliers in last quarter are very difficult to be identified
- Some suggestions:
  - Look at the growth rates
  - Conduct a continuous analysis of external sources to identify reasons of Outliers
  - Where possible always add an economic explanation
  - Be transparent (LS, AO,TC)

Seasonality identification

	Q1	Q2	Q3	Q4
2008	100	200	130	250
2009	90	120	100	190
2010	150	250	240	300
2011	90	120	100	190

Time Series

	I-II	II-III	III-IV	IV-I
2008	+100	-70	+120	-160
2009	+30	-20	+90	-40
2010	+100	-10	+60	-210
2011	+30	-20	+90	

Differences

What happens if we change a value?

Outliers identification

	Q1	Q2	Q3	Q4
2008	100	200	130	250
2009	90	120	100	190
2010	150	250	240	300
2011	90	120	180	190

Time Series

	I-II	II-III	III-IV	IV-I
2008	+	-	+	-
2009	+	-	+	-
2010	+	-	+	-
2011	+	+	+	

Differences

Seasonality & Outliers

	I-II	II-III	III-IV	IV-I
2008	+	-	+	-
2009	+	-	+	-
2010	+	-	+	-
2011	+	+	+	

Differences

It may be an outlier:

- ✓ Additive Outlier
- ✓ Level Shift
- ✓ ~~Transitory Change~~

Seasonal Adjustment

A first overview

	I-II	II-III	III-IV	IV-I
2008	+	-	+	-
2009	+	-	+	-
2010	+	-	+	-
2011	+	-	+	

Differences

This table is good for the first order stationary (mean), but it is not able to find a non-stationary of second order (variance)

Calendar Effects

- Time Series: usually a daily activity measured on a monthly or quarterly basis only
  - Flow: monthly or quarterly sum of the observed variable
  - Stock: the variable is observed at a precise date (example: first or last day of the month)
- Some movements in the series are due to **the variation in the calendar from a period to another**
  - Can especially be observed in flow series
  - Example: the production for a month often depends on the number of days

Calendar Adjustment - Moving Holiday Effect

- Effects from **holidays that are not always on the same day of a month**, such as Labor Day or Thanksgiving. The most important Moving Holiday in the US and European countries is Easter, not only because it moves between days, but also because it moves between months since it can occur in March or April

Calendar Effects

- **Trading Day Effect**
  - Can be observed in production activities or retail sale
  - Trading Days (Working Days) = days usually worked according to the business uses
  - Often these days are non-public holiday weekdays (Monday, Tuesday, Wednesday, Thursday, Friday)
  - Production usually increases with the number of working days in the month

Some questions for you….

Which are the kind of outliers?

What are the causes of the calendar effects?

Focus on

- Decomposition
- X-13 ARIMA vs. Tramo/Seats
- How to use the ESS guidelines on SA

Decomposition Models

- Usual Additive and Multiplicative Models

$$X_t = T_t + C_t + S_t + I_t$$

$$X_t = T_t * C_t * S_t * I_t$$

$$X_t = T_t * (1 + C_t) * (1 + S_t) * (1 + I_t)$$

- More components: Outliers, Calendar Effects

$$X_t = T_t + C_t + S_t + O_t + TD_t + MH_t + I_t$$

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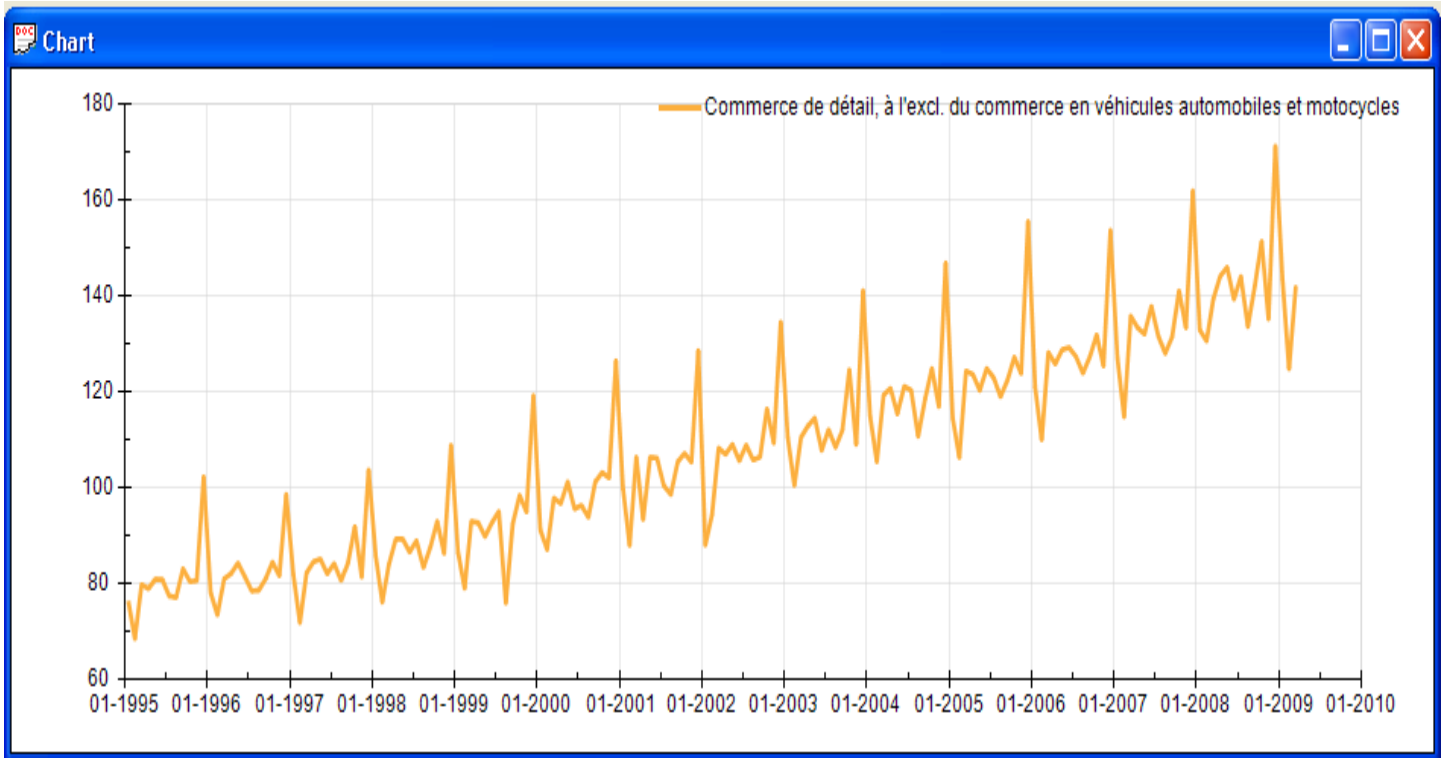
Decomposition Models

A first overview – No Stationary in mean (example)



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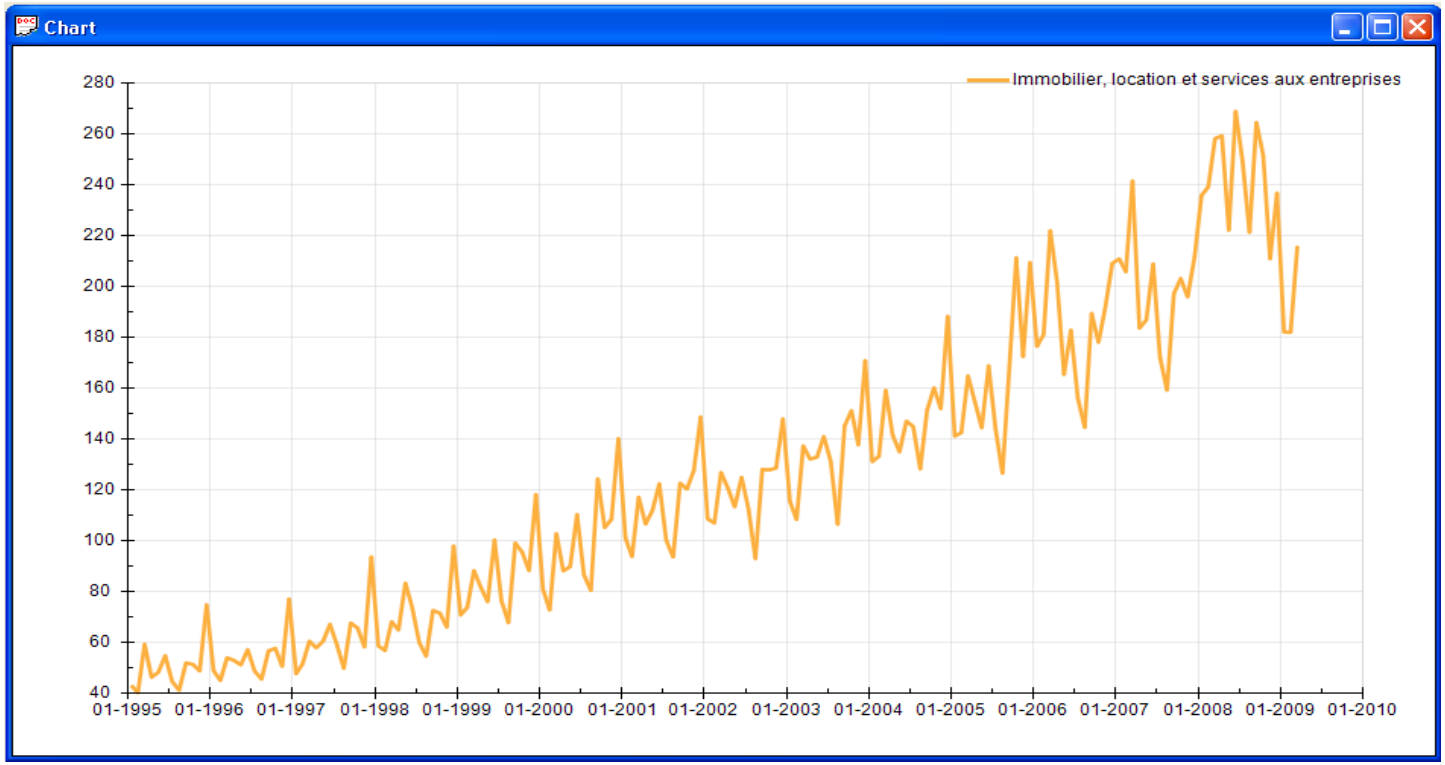
European Commission

Decomposition Models

A first overview – No Stationary in variance (example)



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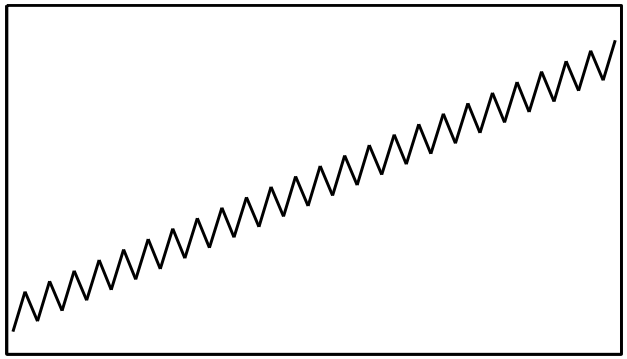
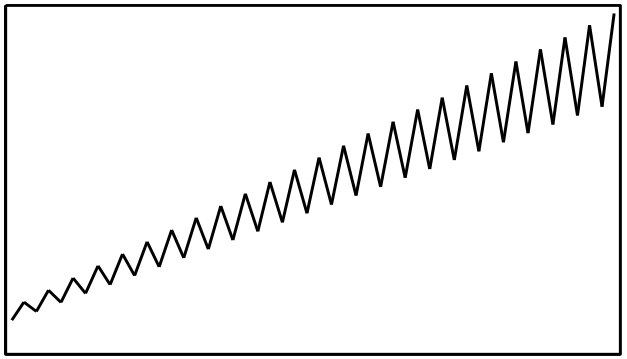
Decomposition Models

Some usual shapes

Additive Model



Multiplicative Model



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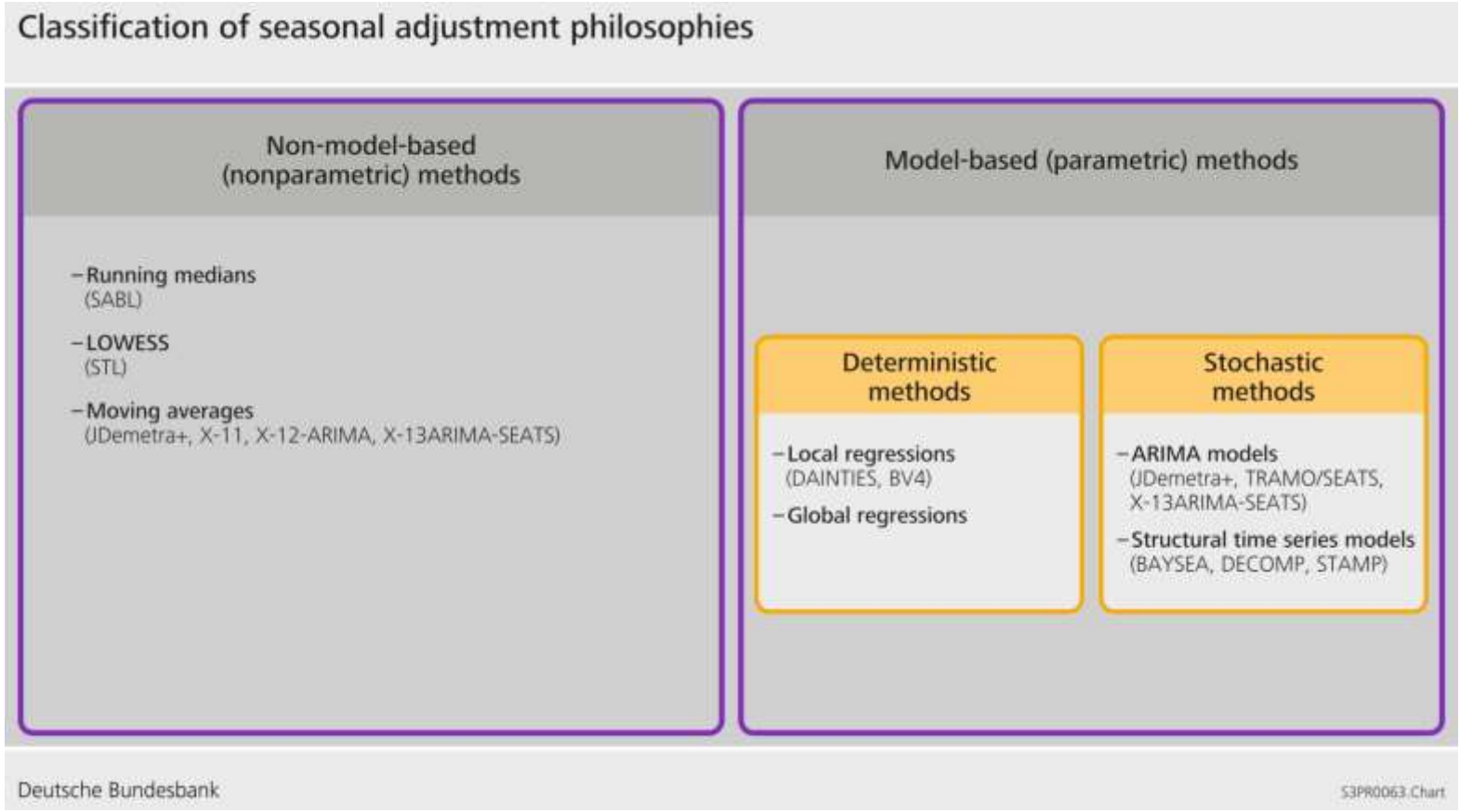
Seasonal Adjustment Philosophies



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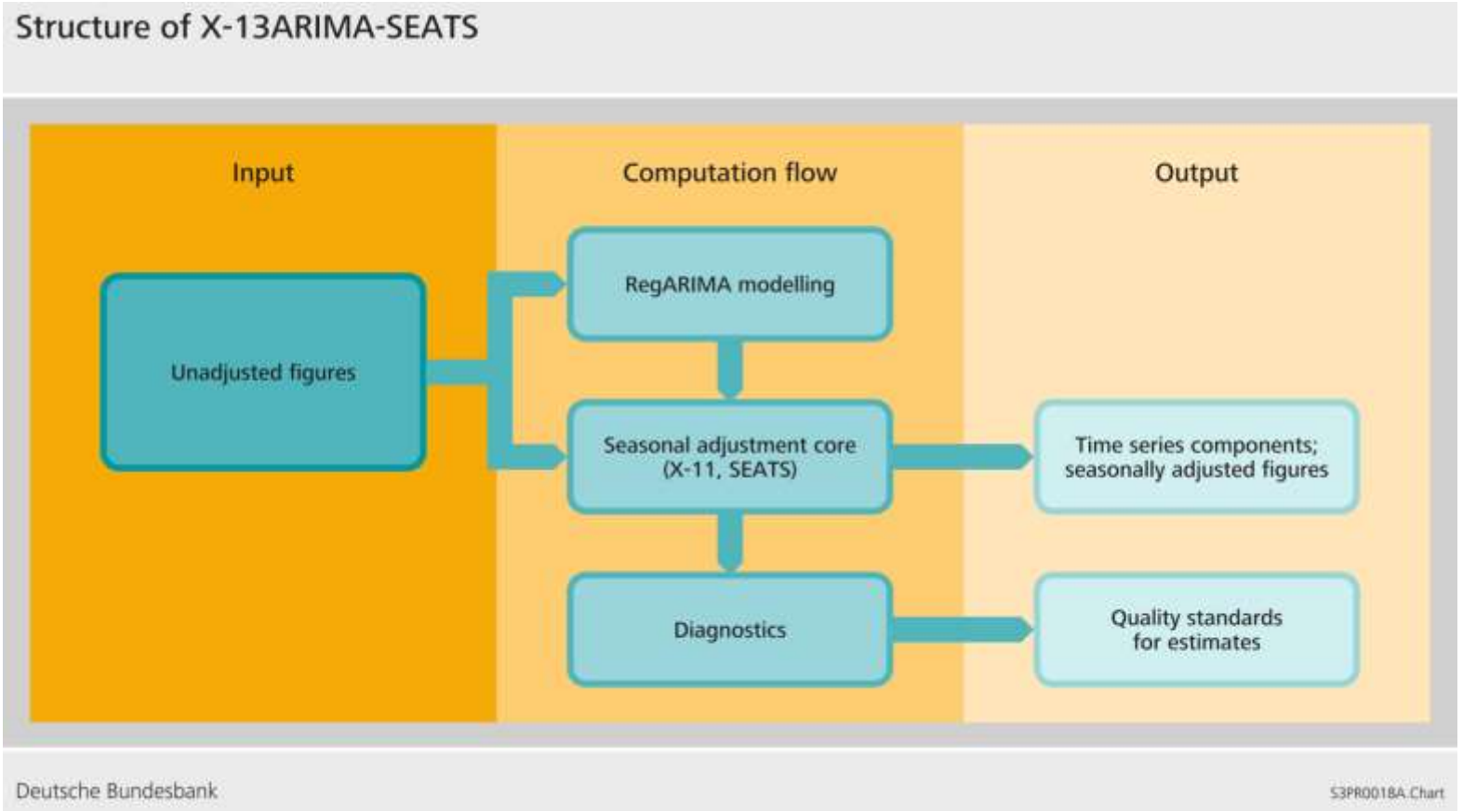
X-13 ARIMA VS TRAMO/SEATS

- Seasonal Adjustment is usually done with an off-the-shelf program. Three popular tools are:
  - X-13 ARIMA (Census Bureau)
  - TRAMO/SEATS (Bank of Spain)
  - JDEMETRA+ (Eurostat), interface X-13 ARIMA and Tramo/Seats
- **X-13 ARIMA is Filter based**: always estimate a Seasonal Component and remove it from the series even if no Seasonality is present, but not all the estimates of the Seasonally Adjusted series will be good
- **TRAMO/SEATS is model based**: method variants of decomposition of Time Series into non-observed components

X-13 ARIMA


Structure of X-13ARIMA-SEATS
Input
Computation flow
Output
Unadjusted figures
RegARIMA modelling
Seasonal adjustment core (X-11, SEATS)
Diagnostics
Time series components; seasonally adjusted figures
Quality standards for estimates
Deutsche Bundesbank
S3PR0018A.Chart

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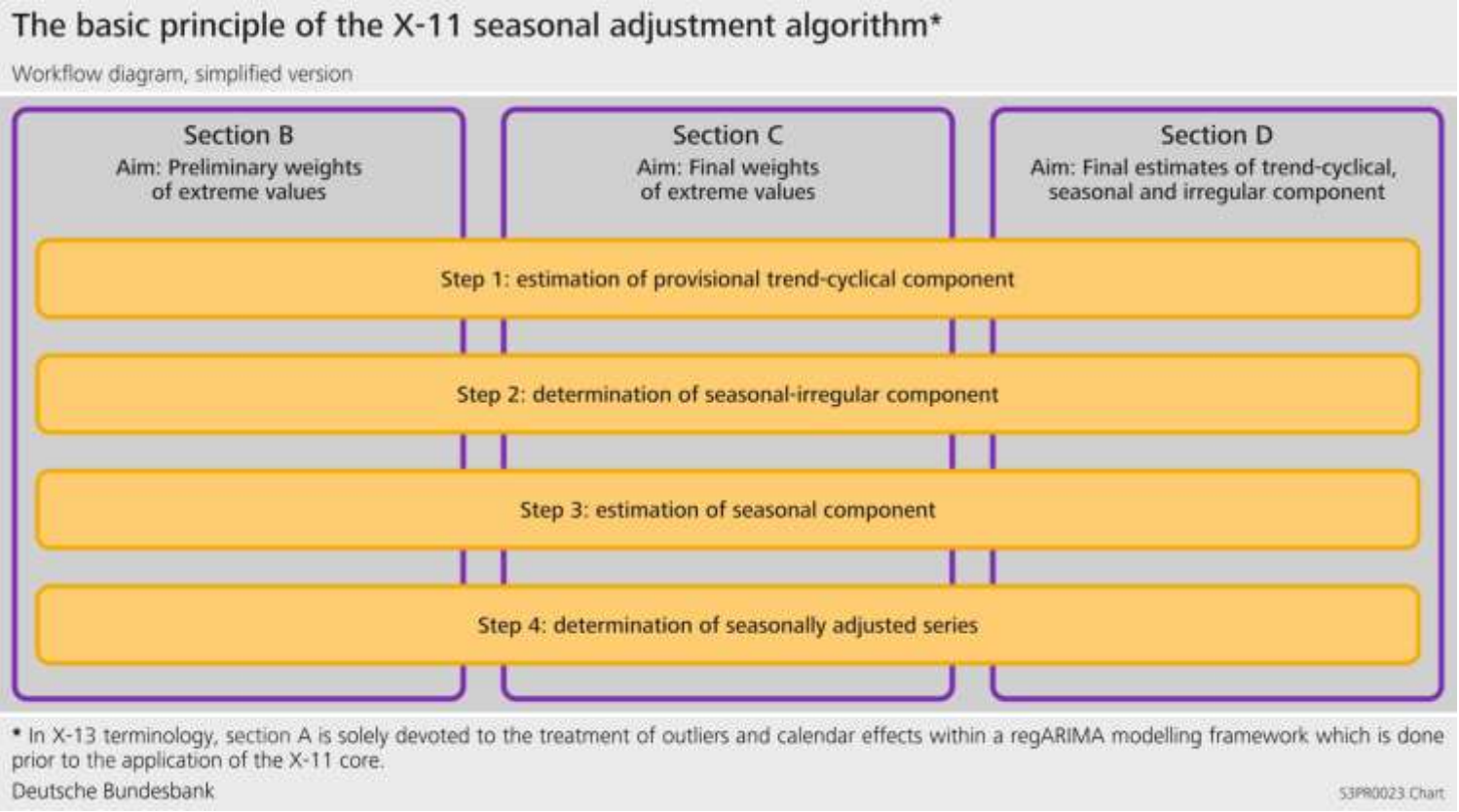
X-13 ARIMA



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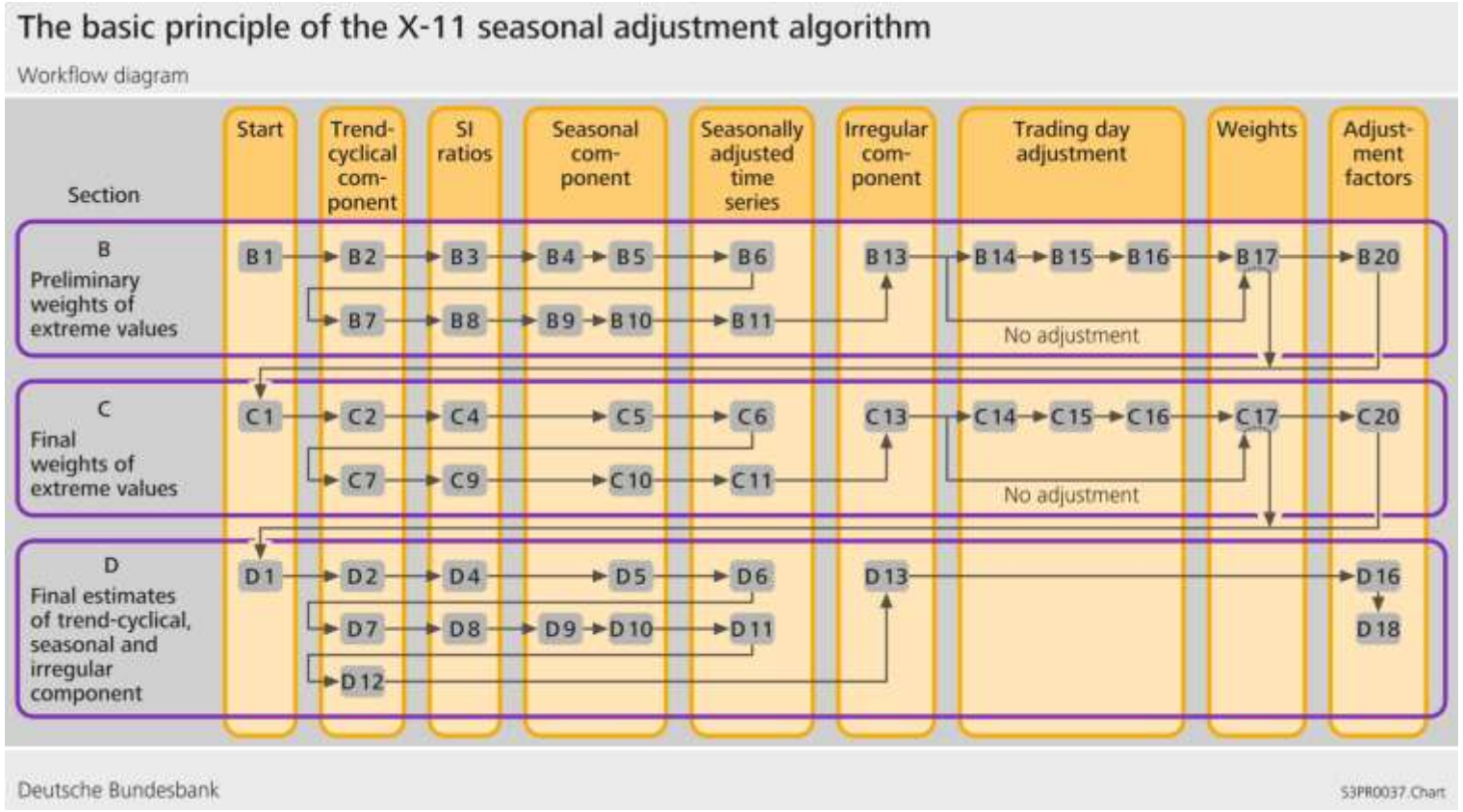
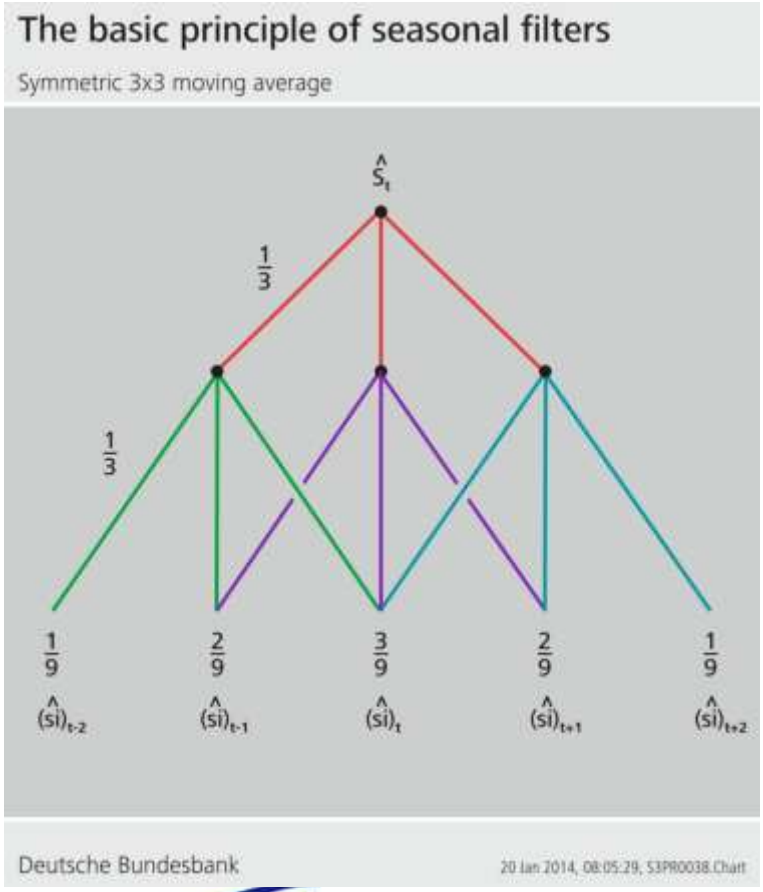
X-13 ARIMA


The basic principle of the X-11 seasonal adjustment algorithm
Workflow diagram
Section
Start
Trend-cyclical com-ponent
SI ratios
Seasonal com-ponent
Seasonally adjusted time series
Irregular com-ponent
Trading day adjustment
Weights
Adjust-ment factors
B
Preliminary weights of extreme values
B1 B2 B3 B4 B5 B6 B13 B14 B15 B16 B17 B20
B7 B8 B9 B10 B11
No adjustment
C
Final weights of extreme values
C1 C2 C4 C5 C6 C13 C14 C15 C16 C17 C20
C7 C9 C10 C11
No adjustment
D
Final estimates of trend-cyclical, seasonal and irregular component
D1 D2 D4 D5 D6 D13 D16
D7 D8 D9 D10 D11 D18
D12
Deutsche Bundesbank
53PR0037.Chart

X-13 ARIMA

- A **Filter** is a weighted average where the weights sum to 1
- **Seasonal Filters** are the filters used to estimate the Seasonal Component. Ideally, Seasonal Filters are computed using values from the same month or quarter (for example an estimate for January would come from a weighted average of the surrounding Januaries)
- The Seasonal Filters available in X-13 ARIMA consist of seasonal Moving Averages of consecutive values within a given month or quarter. An **n x m Moving Average** is an *m*-term simple average taken over *n* consecutive sequential spans

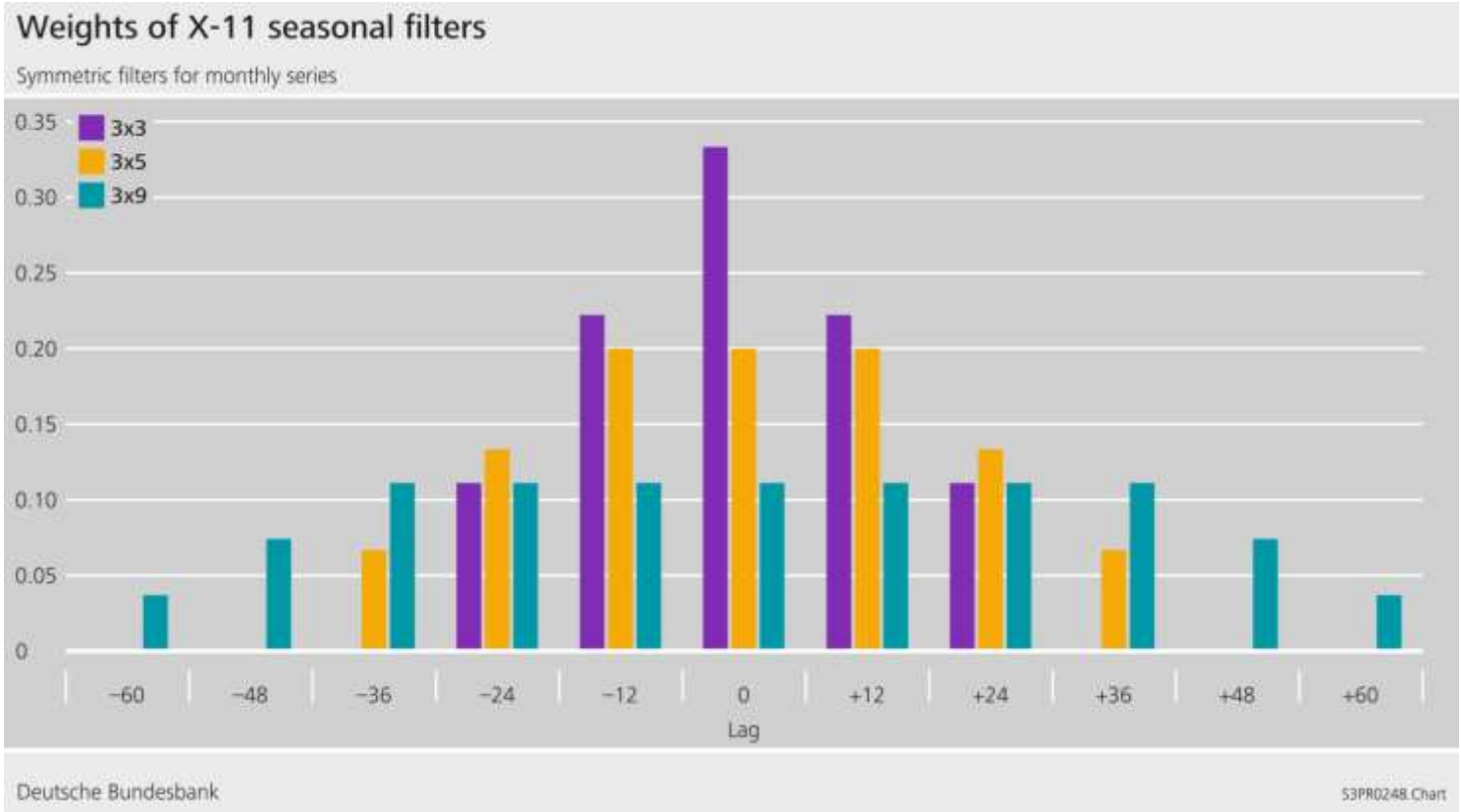
X-13 ARIMA



An example of a 3x3 filter (5 terms) for January 2003 (or Quarter 1, 2003) is:

$$\frac{2001.1 + 2002.1 + 2003.1 + 2002.1 + 2003.1 + 2004.1 + 2003.1 + 2004.1 + 2005.1}{9}$$

X-13 ARIMA


Weights of X-11 seasonal filters
Symmetric filters for monthly series
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
3x3
3x5
3x9
−60
−48
−36
−24
−12
0
+12
+24
+36
+48
+60
Lag
Deutsche Bundesbank
S3PR0248.Chart

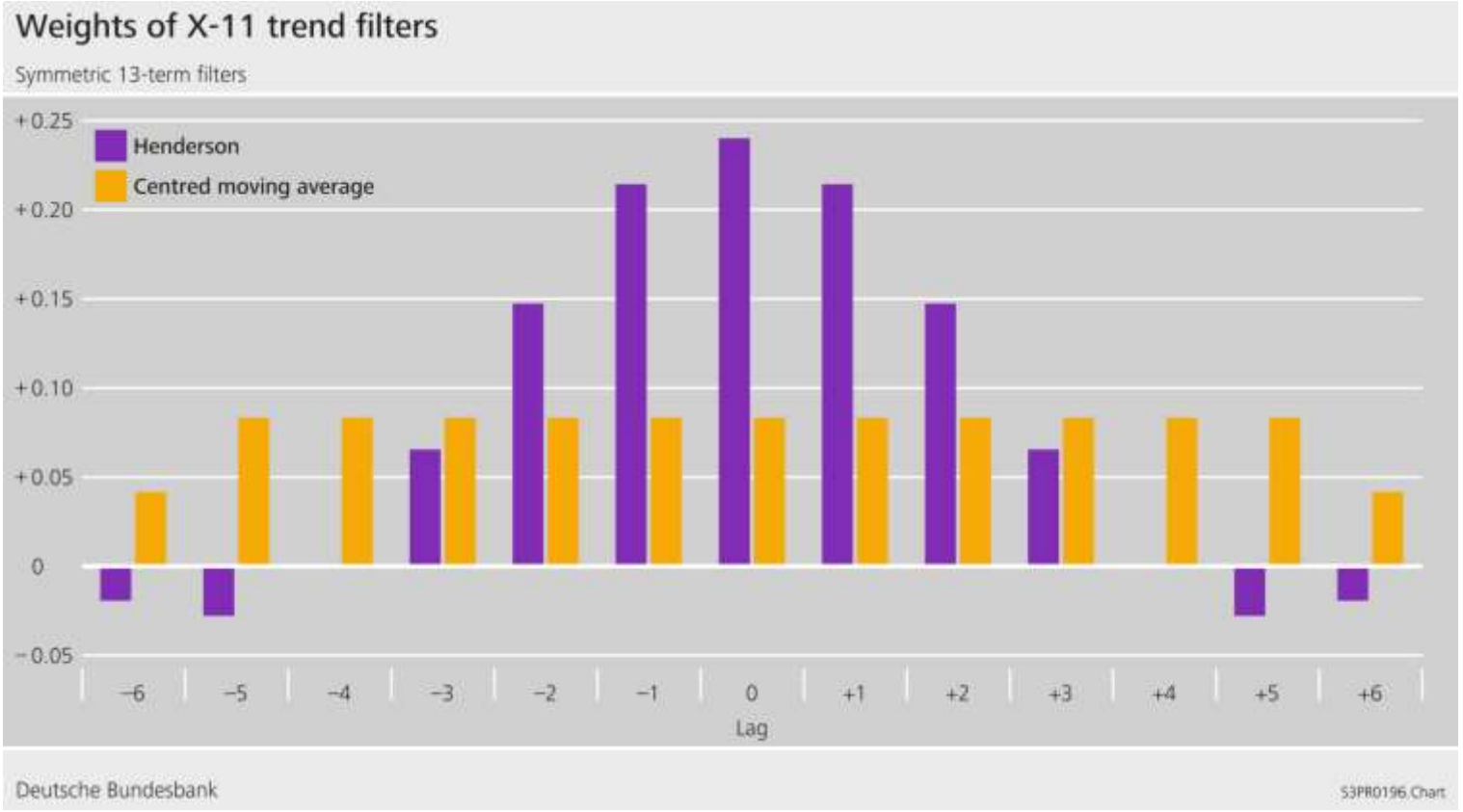
X-13 ARIMA

- **Trend Filters** are weighted averages of consecutive months or quarters used to estimate the trend component
- An example of a 2x4 filter (5 terms) for First Quarter 2005:

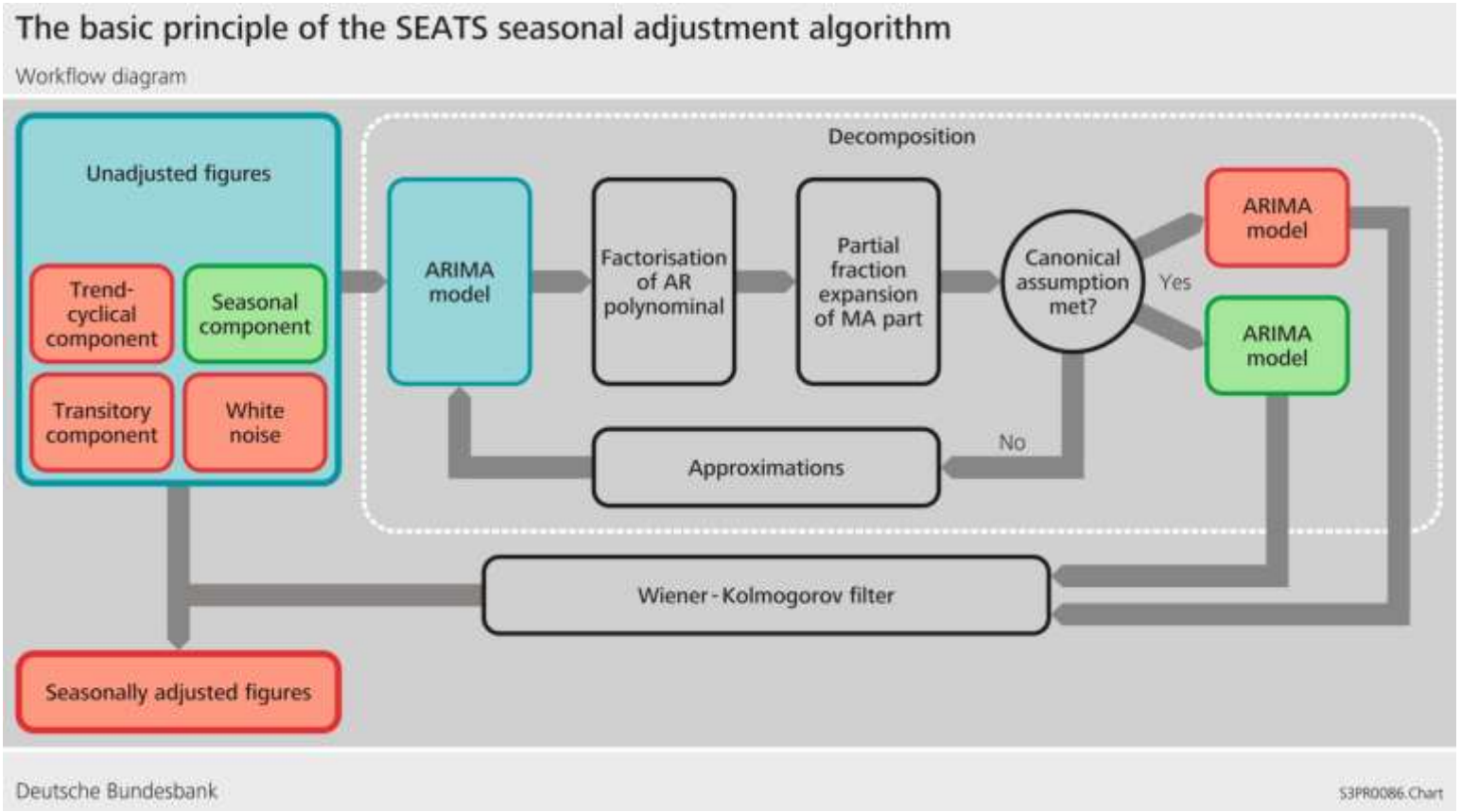
$$\frac{2004.3 + 2004.4 + 2005.1 + 2005.2}{2004.4 + 2005.1 + 2005.2 + 2005.3}{8}$$

- Notice that we are using the closest points, not just the closest points within the First Quarter like with the Seasonal Filters above
- Notice also that every quarter has a weight of 1/4, though the Third Quarter uses values in both 2004 and 2005

X-13 ARIMA


Weights of X-11 trend filters
Symmetric 13-term filters
+0.25
+0.20
+0.15
+0.10
+0.05
0
−0.05
Henderson
Centred moving average
−6
−5
−4
−3
−2
−1
0
+1
+2
+3
+4
+5
+6
Lag
Deutsche Bundesbank
S3PR0196 Chart

TRAMO/SEATS


The basic principle of the SEATS seasonal adjustment algorithm
Workflow diagram
Unadjusted figures
Trend-cyclical component
Seasonal component
Transitory component
White noise
Decomposition
ARIMA model
Factorisation of AR polynominal
Partial fraction expansion of MA part
Canonical assumption met?
Yes
No
ARIMA model
ARIMA model
Approximations
Wiener - Kolmogorov filter
Seasonally adjusted figures
Deutsche Bundesbank
S3PR0086.Chart

TRAMO/SEATS

- The objective of the procedure is to **automatically identify the model** fitting the Time Series and **estimate the model parameters**. This includes:
  - The selection between additive and multiplicative model types (log-test)
  - Automatic detection and correction of Outliers, eventual interpolation of missing values
  - Testing and quantification of the Trading Day effect
  - Regression with user-defined variables
  - Identification of the ARIMA model fitting the Time Series, that is selection of the order of differentiation (unit root test) and the number of autoregressive and Moving Average parameters, and also the estimation of these parameters

TRAMO/SEATS

- The application belongs to the ARIMA model-based method variants of decomposition of Time Series into non-observed components
- The decomposition procedure of the SEATS method is built on spectrum decomposition
- Components estimated using Wiener-Kolmogorov Filter
- SEATS assumes that:
  - The Time Series to be Adjusted Seasonally is linear, with normal White Noise innovations
  - If this assumption is not satisfied, SEATS has the capability to interwork with TRAMO to eliminate special effects from the series, identify and eliminate Outliers of various types, and interpolate missing observations
  - Then the ARIMA model is also borrowed from TRAMO

TRAMO/SEATS

- The application **decomposes the series into several various components**. The decomposition may be either multiplicative or additive
- The components are characterized by the spectrum or the pseudo spectrum in a non-stationary case:
  - The Trend Component represents the long-term development of the Time Series, and appears as a spectral peak at zero frequency. One could say that the Trend is a Cycle with an infinitely long period
  - The effect of the Seasonal Component is represented by spectral peaks at the seasonal frequencies
  - The Irregular Component represents the irregular White Noise behaviour, thus its spectrum is flat (constant)
  - The Cyclic Component represents the various deviations from the trend of the Seasonally Adjusted series, different from the pure White Noise

TRAMO/SEATS

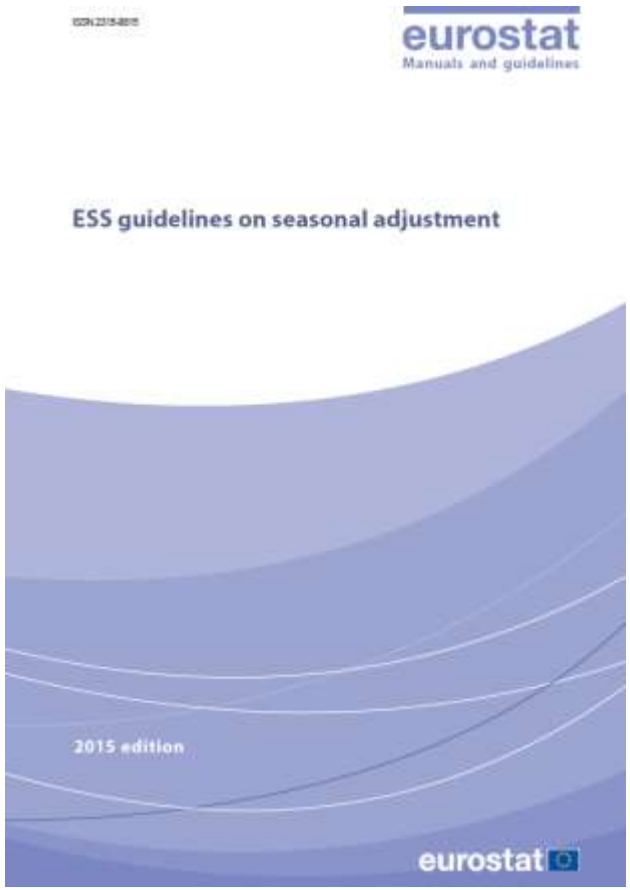
- First SEATS decomposes the ARIMA model of the Time Series observed, that is, identifies the ARIMA models of the components. This operation takes place in the frequency domain. The spectrum is divided into the sum of the spectra related to the various components
- Actually SEATS decides on the basis of the argument of roots, which is mostly located near to the frequency of the spectral peak
  - The roots of high absolute value related to 0 frequency are assigned to the Trend Component
  - The roots related to the seasonal frequencies to the Seasonal Component
  - The roots of low absolute value related to 0 frequency and the Cyclic (between 0 and the first Seasonal frequency) and those related to frequencies between the Seasonal ones are assigned to the Cyclic Component
  - The Irregular Component is always deemed as white noise

ESS Guidelines on Seasonal Adjustment

- Introduced in 2009 and revised in 2015

http://ec.europa.eu/eurostat/documents/3859598/6830795/KS-GQ-15-001-EN-N.pdf

- Items providing:
  1. Description of the issue
  2. List of options which could be followed to perform the step
  3. Prioritized list of three alternatives from most recommended one to the one to avoid (A, B and C)
  4. Concise list of main references



Some questions for you….

What is a filter?

What is the main difference between X-13 ARIMA and TRAMO/Seats method?

Focus on

- Step by Step procedure
- How to use the ESS guidelines on SA
- JDemetra+

Step by step procedures for SA

- Step 0: **Number of observations**
  - It is a requirement for Seasonal Adjustment that the Times Series have to be **at least 3 years-long** (36 observations) for monthly series and 4 years-long (16 observations) for quarterly series. If a series does not fulfill this condition, it is not long enough for Seasonal Adjustment. Of course these are minimum values, series can be longer for an adequate adjustment or for the computation of diagnostics depending on the fitted ARIMA model

Step by step procedures for SA

- Step 1: **Graph**
  - It is important to have a look at the **data and graph** of the original Time Series
  - Series with possible Outlier values should be identified.
  - The missing observations in the Time Series should be identified and explained. Series with too many missing values will cause estimation problems
  - If series are part of an aggregate series, it should be verified that the starting and ending dates for all component series are the same

Step by step procedures for SA

- Step 2: **Constant in variance**
  - **The type of decomposition model should be decided based on the diagnostics**. Options are Additive and Multiplicative (log transformation) decomposition
  - If the series has zero and negative values, then this series must be additively adjusted
  - If the series has a decreasing level with positive values close to zero, then multiplicative adjustment must be used

Step by step procedures for SA

- Step 3: **Calendar Effects**
  - It should be determined which regression effects, such as **Trading/Working Day**, **Leap Year**, **Moving Holidays** (e.g. Easter) and national holidays, are plausible for the series
  - If the effects are not plausible for the series or the coefficients for the effect are not significant, then regressors should not be fit for the effects
  - If the series is long enough and the coefficients for the effect are high significant then the six regressors versions of the Trading Day effect should be used instead of one

Step by step procedures for SA

- Step 4: **Outliers**
  - There are two possibilities to identify Outliers. **The first is when we identify series with possible Outlier values as in STEP 1**. If some Outliers are marginally significant, it should be analysed if there is a reason to keep the Outliers in the model. **The second possibility is when automatic Outlier correction is used**. The results should be confirmed by looking at graphs of the series and any available information (economic, social, etc.) about the possible cause of the detected Outlier should be used
  - A high number of Outliers signifies that there is a problem related to weak stability of the process, or that there is a problem with the reliability of the data. Series with high number of Outliers relative to the series' length should be identified. This can result in regression model over-specification.
  - **Check from period to period the location of Outliers**, because it should be not always the same

Step by step procedures for SA

- Step 5: **ARIMA model**
  - **Automatic model identification should be used once a year**, but the re-estimation the parameters are recommended when new observation appends.
  - High-order ARIMA model coefficients that are not significant should be identified. It can be helpful to simplify the model by reducing the order of the model, taking care not to skip lags of AR models. For Moving Average (MA) models, it is not necessary to skip model lags whose coefficients are not significant.
  - The BIC and AIC statistics should be looked at in order to confirm the global quality of fit statistics

Step by step procedures for SA

- Step 6: **Check the filter** (*optional*)
  - Short filters for stable seasonal pattern
  - The SI-ratio Graphs in the X-12 ARIMA output file should be looked at. Any month with many extreme values relative to the length of the time series should be identified. This may be needed for raising the sigma limits for the extreme value procedure

Step by step procedures for SA

- Step 7: **Residuals**
  - **<u>There should not be any residual Seasonal and Calendar Effects in the published Seasonally Adjusted series or in the Irregular Component</u>**
  - If the series is a composite indirect adjustment of several component series, the checks mentioned above in aggregation approach should be performed
  - Among others the diagnostics of normality and Ljung-Box Q-statistics should be looked at in order to check the residuals of the model

Step by step procedures for SA

- Step 8: **Diagnostics**
  - The stability diagnostics for Seasonal Adjustment are the sliding spans and revision history. Large revisions and instability indicated by the history and sliding spans diagnostics show that the Seasonal Adjustment is not useful

Step by step procedures for SA

- Step 9: **Publication policy**
  - A reference paper with the quality report (if it is available) should be issued once a year as a separate publication which has to include the following information:
    1. The Seasonal Adjustment method in use
    2. The decision rules for the choice of different options in the program
    3. The aggregation policy
    4. The Outlier detection and correction methods
    5. The decision rules for transformation
    6. The revision policy
    7. The description of the Working/Trading Day adjustment
    8. The contact address

What is JDEMETRA+?

JDEMETRA+ is an econometric tool for Seasonal and Calendar Adjustment developed by National Bank of Belgium for EUROSTAT

Identify more components

- **Trend-Cycle Component**
- **Outliers**
- **Irregular Component**

What is JDEMETRA+?

JDemetra+ provides new Java implementations of TRAMO-SEATS and of X12-ARIMA.
Other time series problems, like modelling, benchmarking, temporal disaggregation are also considered.
JDemetra+, which is based on the NetBeans platform, is developed under the EUPL license.

JD+ history

2002 Demetra

- Program to compare X-12-ARIMA and TRAMO/SEATS (1997/98).
- Integration of original software in a user-friendly application.
- Lack of sufficient product development and handling of errors as a result of a loss of technical knowledge about software.

2010 Demetra+

- Developed in cooperation between Eurostat and the National Bank of Belgium.
- Enables the implementation of the ESS Guidelines on SA.
- Provides graphical interface and common input/output diagnostics for TRAMO/SEATS and X-12-ARIMA.
- Includes complex technical solutions. Uses .NET technology and can be used only under Windows.

2015 JDemetra+

- Fortran codes re-written in JAVA.
- Open source, platform independent.
- Extensible graphical interface, based on the NetBeans platform (plugins).
- Developed by the National Bank of Belgium, supported by the Deutsche Bundesbank for the X-11 part.

JDemetra+ characteristics

- **Flexibility**
  Encompasses the leading SA algorithms and can evolve independently
- **Versatility**
  Can be used in a rich graphical interface and/or be integrated in other.
- **Reusability of modules the other circumstances:**
  Plug-in for temporal disaggregation
  Outliers detection, estimation of missing values, Arima forecasts
- **Extensibility**
  Additional plug-ins and modules do not change the core engines.
- **Efficient process of large datasets through:**
  JWSAcruncher, command line application that allows calling JDemetra+ from other applications;
  Web services and Direct call to Java libraries.
- **Open source**

Users are involved in validation tests

The scope of tests:

- **A large scale study comparing the performances of several software on a large bunch of time series.**
- **Reproducing SA process & Functional testing.**

Outcomes:

- **JDemetra+ is faster and more robust to invalid adjustments than X12/X13.**
- **Differences usually small (<1%) in levels and in growth rates.**

Official Release of JD+ 2.0.0

Since the 2nd of February 2015 JD+ is the official software to be used for Seasonal Adjustment of data to be used for Official Statistics

Official joint ECB/Eurostat Methodological Note published on CROS portal at:

- **http://www.cros-portal.eu/content/official-release-jdemetra-software-be-used-seasonal-adjustment**

Documentation

JDemetra+ Quick Start

JDemetra+ User Guide

JDemetra+ Reference Manual

Modules, code and developers documentation and GitHub

- **https://github.com/jdemetra for the official modules**
- **https://github.com/nbbrd for NBB resources**

Migration to JDemetra+

Done

Statistics Portugal
Eurostat (some units)
Statistics Finland
Central Statistical Bureau of Latvia
Narodowy Bank Polski (some units)
Statistics Belgium
The National Bank of Belgium
HCSO

In progress or planned

- Turkstat
- OECD
- Statistics Slovenia
- Statistics Denmark
- Croatian Bureau of the Census
- BundesBank
- INSEE
- Statec
- ELSTAT
- ONS
- Central Statistics Office Ireland

Product development

Plugins *(* = planned)*

- **Other statistical topics**
  - Structural models and other advanced model-based seasonal adjustment methods;
  - Chain-Linked Indices Aggregation and Disaggregation;
  - Benchmarking, temporal disaggregation;
  - Dynamic factor models (nowcasting);
  - Business cycle analysis*;
  - Bayesian VAR*.
- **Seasonal adjustment tools**
  - Enriched output;
  - Enhanced direct/indirect SA and balancing tool*.
- **Others**
  - Data providers for SDMX WEB services;
  - Light scripting language (for batch processing)*.

JDEMETRA+ training courses ESTP

PRACTICAL INFORMATION				
WHEN	DURATION	WHERE	ORGANISER	APPLICATION VIA NATIONAL CONTACT POINT
19 - 21.09.2017	3 days	Eurostat, Luxembourg	Eurostat	**Deadline: 14.07.2017**

Free Registration at
http://ec.europa.eu/eurostat/web/ess/about-us/estp

JDEMETRA+ Helpdesk

Remote support provided by the Centre of Excellence on Seasonal Adjustment

http://ec.europa.eu/eurostat/cros/content/seasonal-adjustment-centre-excellence_en

Send your request also via

http://ec.europa.eu/eurostat/cros/content/ess-seasonal-adjustment-helpdesk_en

Some questions for you….

What are the main steps of Seasonal Adjusment?

Why using JDEMETRA+?

Questions for me?