New R tools for JDemetra+ software:
Seasonal adjustment made easier

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1. INTRODUCTION

RJDemetra [1] package is an interface between R and JDemetra+ [2], the Eurostat recommended seasonal adjustment software, offering full access to its seasonal adjustment routines. Several add-in packages: rjdworkspace [3], rjdqa [4], rjdmarkdown [5], ggdemetra [6], expand its features.

This paper aims at describing and illustrating the functionalities of those packages, used stand-alone or in conjunction with JDemetra+ interface, thus showing how to take advantage of their complementarity, according to the user's needs, be it mass production or detailed analysis. Two complementary audiences might benefit from the tools and procedures described here: JDemetra+ users seeking extended functionalities in R but also R users, not familiar with JDemetra+, needing to perform reliable seasonal adjustment using officially recommended algorithms.

In the next two paragraphs, we present in more detail JD+ software and the R packages. The methods section outlines the functionalities provided by the R packages. The results section provides a brief illustration.

1.1. JDemetra+ software

JDemetra+ [2] is an open source software for seasonal adjustment (SA), outlier detection, time series modeling, nowcasting and temporal disaggregation. It has been officially recommended by Eurostat to ESS members since 2015. For seasonal adjustment, our focus here, JDemetra+ implements the concepts and algorithms used in the two currently leading methods worldwide: Tramo/Seats [7] and X13-Arima-Seats [8]. It provides the user with a rich graphical interface, facilitating quality assessment, as well as a production module, the cruncher, designed for batch treatments.

However, comparisons of several versions of the same data, adjusted with different sets of specifications can be hard to deal with within the graphical interface. We will show how RJDemetra can help avoiding going through export and reimport, which often includes reformatting of key variables like the date itself.

1.2. New R packages for JDemetra+

The recent R interface for JDemetra+ made X12-Arima and Tramo-Seats SA algorithms as well as JDemetra+ rich output (series, specifications and diagnostics) directly available in R. The core package, RJDemetra, was released in 2018. It has been since enriched with several add-ins: rjdworkspace for workspace processing, rjdqa for quality assessment, ggdemetra for seasonal adjustment specific graphics with ggplot2 and rjdmarkdown for printing SA processing features in Latex or Html format.

2. METHODS

In this section, we describe, in a need-driven approach, some interesting functionalities available in this toolbox, when used stand-alone or in conjunction with JDemetra+ graphical user interface.

2.1. Seasonal Adjustment in R

The R user can perform seasonal adjustment with Tramo-Seats or X12-Arima with a predefined or a user-defined specification, including user defined calendar regressors and intervention variables. Specification modification is available in a "save as" manner, from any existing specification, previously defined via JDemetra+ graphical user interface or in R, which makes easier massive parameters adjustment for simulation or production purposes. JDemetra+ style graphics can be readily customized in R and the ggdemetra package ensures a link with the ggplot2 package.

2.2. Time series analysis combining JDemetra+ graphical interface and R packages

RJDemetra gives instant access to the entire output, series, specifications and diagnostics, available in JDemetra+. Monitoring and fine-tuning an SA process can be simultaneously done from JDemetra+ graphical interface and R. The graphical interface offers structured feedback whereas R provides the comparison facilities, not available within the interface. Without exporting and reimporting data, the user is able to see the impact of parameters adjustment on the spot. The parameters changes can be assessed on a macro and micro level: first spotting problematic revisions or specification shifts compared to a previous version of the data, then fine-tuning parameters on selected series.

2.3. Processing JDemetra+ specific data format

RJDemetra allows importing, creating and exporting workspaces, the JDemetra+ specific data format, containing all the data and specifications required for the seasonal adjustment process. The add-in package rjdworkspace enables merging workspaces, updating metadata changing the input time series and the specification model.

2.4. Quality assessment and reporting

The rjdqa add-in can readily help setting up a quality assessment report using JDemetra+ diagnostics. For a single-series detailed analysis, it provides a convenient dashboard. More relevant information or diagnostics on the seasonal adjustment process can be printed in a Latex or html format, using rjdmarkdown.

3. RESULTS

A short example is presented below. The full paper will provide the R code, outputs and appropriate references to JDemetra+ graphical interface to outline in detail the capabilities of the aforementioned packages.

```r
#adjusting a raw time series with X13 (défaut specification="RSA5c")
sa_x13<-x13(raw_time_series)
# modifying the previously used specification, in a "save as" manner
# adding an additive outlier in march 2020
new_spec<- x13_spec(sa_x13,
                    usrdef.outliersEnabled = TRUE,
                    usrdef.outliersType = c("AO"),
```

```
                          usrdef.outliersDate = c("2020-03-01"))
#re-adjusting with the new spec
sa_x13_new<-x13(raw_time_series,spec=new_spec)
# plotting the results in JDemetra+ style with customized time window
plot(sa_x13$final, first_date = c(2015, 1),
     caption = "Raw, SA, Trend", type_chart = "sa-trend")
```
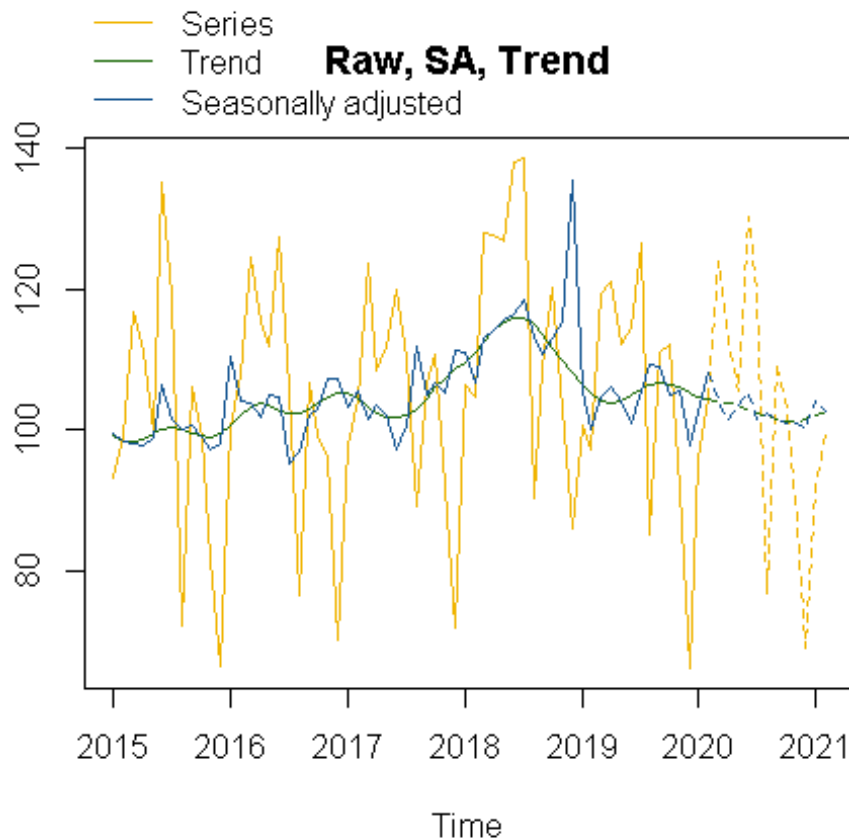

4. CONCLUSIONS

RJDemetra, and its add-in packages, offer full access JDemetra+ seasonal adjustment routines and provide the user with convenient additional functionalities. A broader tool selection is henceforth available for seasonal adjustment; JDemetra+ graphical interface, cruncher and R packages can be used in conjunction for greater benefit.

4.1. Further developments

Further developments will aim at adding a data-refresh "cruncher like" function to facilitate infra-annual production.

Additional packages will be developed to cover more JDemetra+ features, such as seasonal adjustment and anomaly detection in a state space framework.

REFERENCES

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