RJDemetra: an R interface to JDemetra+

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1 Introduction

RJDemetra is a R interface to JDemetra+, the seasonal adjustment software officially recommended by Eurostat and the European Central Bank (ECB) to the members of the European Statistical System (ESS) and the European System of Central Banks (ESCB).
JDemetra+ is a developed by the National Bank of Belgium (NBB) in cooperation with the Deutsche Bundesbank with the support of Eurostat, in accordance with the ESS Guidelines on Seasonal Adjustment. It implements the two leading seasonal adjustment methods TRAMO/SEATS+ [1, 2] and X-12ARIMA/X-13ARIMA-SEATS [3, 4].
R is a programming language and free software environment for statistical computing and free software widely use by statisticians.
RJDemetra is a R package that offers full access to all JDemetra+ options and outputs. It also offers many possibilities to the users to implement new tools for the production of seasonally adjusted series thanks to all the libraries already available in R. RJDemetra is available on github: https://github.com/nbbrd/RJDemetra.

2 Methods

RJDemetra relies on the Java libraries use in JDemetra+: the algorithms are not implemented inside the package. The link between R and Java libraries is done with the rJava package, which is a low-level R to Java interface. The consequence is that the results of the seasonal adjustment done using R are certified by the use of JDemetra+ and the system requirements needed to install the package are the same needed to use JDemetra+ (Java SE 8 or later).
The goal of the RJDemetra package is to offer a "pure R" package to the users, more familiar with this language rather than with Java. It allows an easy integration of the seasonal adjustment process in IT production systems and offers the possibility to implements new tools that are difficult to integrate into the graphical interface of JDemetra+, as for examples:

- The comparison of the direct and indirect adjustments;
- The automatic generation of dashboards to summarise the information on the seasonal adjustment ;
- The generation of quality reports.

3 Results

In the current version of the RJDemetra package, users can:

- Seasonally adjust their time series with the TRAMO-SEATS and/or X-13-ARIMA;

- Use the regARIMA-based preadjustment method implemented in TRAMO-SEATS and X-13-ARIMA;
- Manipulate JDemetra+ workspaces to easily switch to the JDemetra+ graphical interface. The current functionalities are:
    - Import of JDemetra+ workspace in R (raw data and seasonal adjustment specifications);
    - Export of specifications created via RJDemetra to a JDemetra+ workspace.

All seasonally adjust objects created by RJDemetra are S3 classes [5] with basic methods: `print()`, `plot()` and `summary()` (for regARIMA models).
Let's see an example with the French manufacturing industrial production index (https://www.insee.fr/en/statistiques/serie/010537903). The time series can be seasonally adjusted with the X-13-ARIMA method using the function `x13_def()`. The main results are presented in figure 1 created by the `plot()` function.

```
library(RJDemetra)
x13_ipi <- x13_def(ipi_french, spec = "RSA3")
plot(x13_ipi, type_chart = "sa-trend")
```

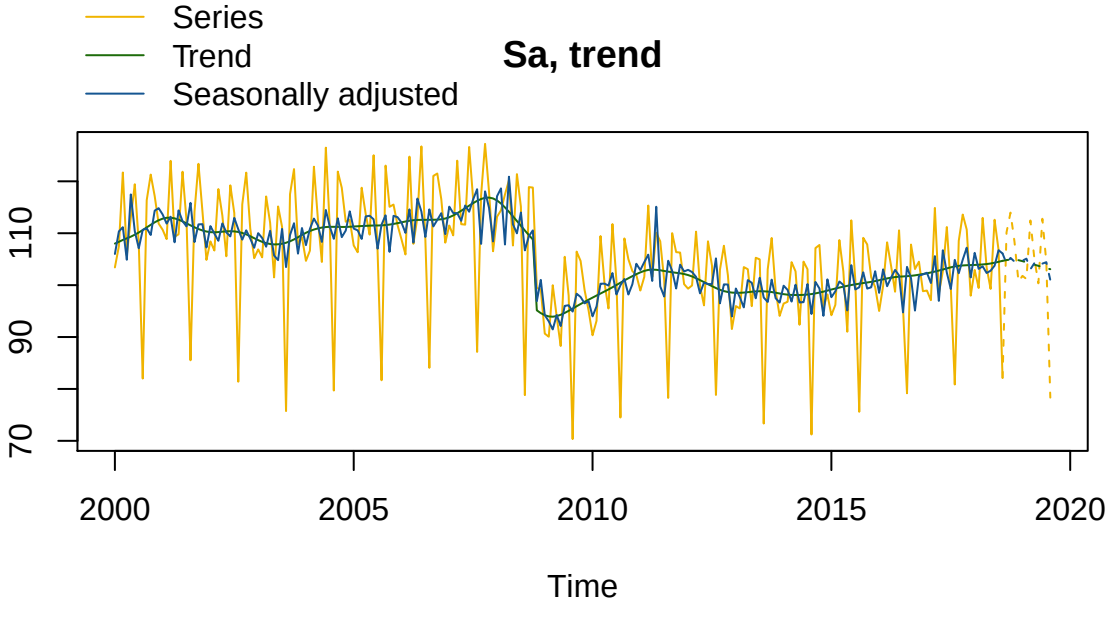

Figure 1: Result of the seasonal adjustment process for the french IPI in manufacturing

More complex figures are also implemented to get more details on the components of the series, like S-I-ratio (figures 2).

```
plot(x13_ipi$decomposition, ask = FALSE)
```

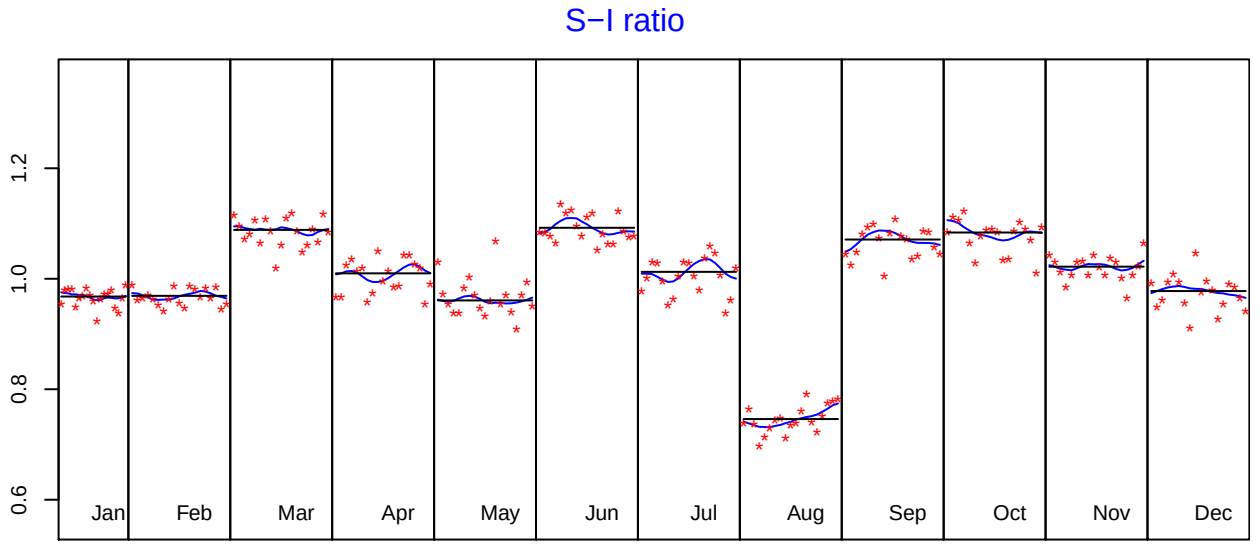

Figure 2: S-I ratio

Other R libraries can also be used on the result of the seasonal adjustment model, not available in JDemetra+. So, for example, the Diebold-Mariano test [6] (implemented in the forecast package) can be used to compare the forecast accuracy of two regARIMA models, as the Shapiro-Wilk test of normality [7] on the residuals of a regARIMA model:

```
shapiro.test(x13_ipi$regarima$residuals)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  x13_ipi$regarima$residuals
## W = 0.99401, p-value = 0.5564
```

4 Conclusions

More user-friendly than Java libraries for non-programmers, the RJDemetra package offers many new possibilities to the users, whether to facilitate production or to carry out studies. The paper would present the main functions and the structure of the package.

References

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