SACE Meeting #5, 4 October 2018

R and JDemetra+ : RJDemetra and rjdqa

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Purpose of the RJDemetra package

- Complete R package for Tramo-Seats and X13
- Users: "pure R" package
  - Part of R routines, automatization
    - Batch processing
    - E.g.: direct vs indirect aggregates adjustment, dashboards
  - Usage of other R functions and packages
- JD+ functionality
  - Modeling and seasonal adjustment
  - Full specification
- Advanced graphical presentation: JD+

Current status

- RegARIMA, TRAMO-SEATS and X-13-ARIMA:
  - R package with documentation
  - S3 classes with plot, summary, print methods
  - Possibility to add user-defined regressors but not user-defined calendar regressors
- Manipulate workspace (only TRAMO-SEATS and X-13-ARIMA):
  - Import JD+ workspace to get: input raw series or SA model
  - Export R models created via RJDemetra

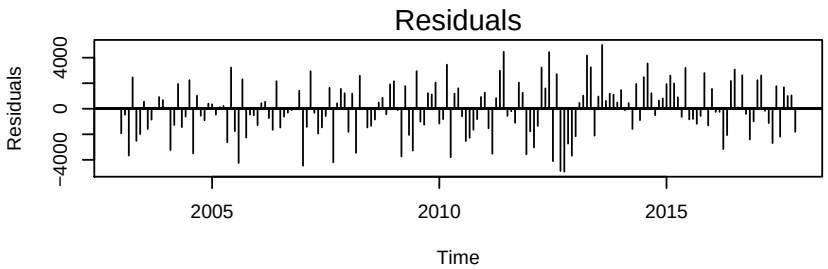
RegARIMA examples (1/3)

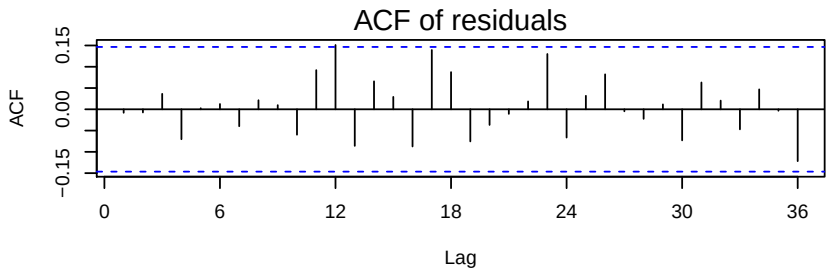
```
library(RJDemetra)
regarima_model <- regarima_def_x13(myseries, spec = "RG4c")
regarima_model # Or summary(regarima_model) to have more details
```

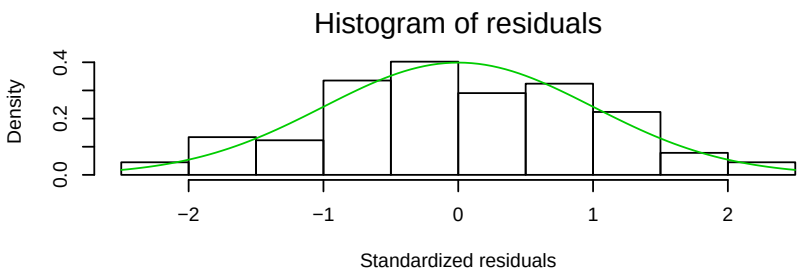
```
## y = regression model + arima (1, 1, 2, 0, 1, 1)
## Log-transformation: no
## Coefficients:
##           Estimate Std. Error
## Phi(1)     -0.8317      0.076
## Theta(1)   -0.7989      0.100
## Theta(2)    0.2495      0.081
## BTheta(1)  -0.7631      0.060
##
##              Estimate Std. Error
## Mean            -289.3     129.59
## Week days       -146.6      31.14
## Leap year       1007.0     764.42
## LS (10-2008)   37838.8    1913.00
## LS (1-2003)   -18866.6    2013.42
## AO (1-2002)    14719.0    1536.27
## LS (1-2015)    16158.1    2692.61
## LS (9-2011)     7401.2    1914.06
## AO (4-2012)    -5428.6    1397.40
```

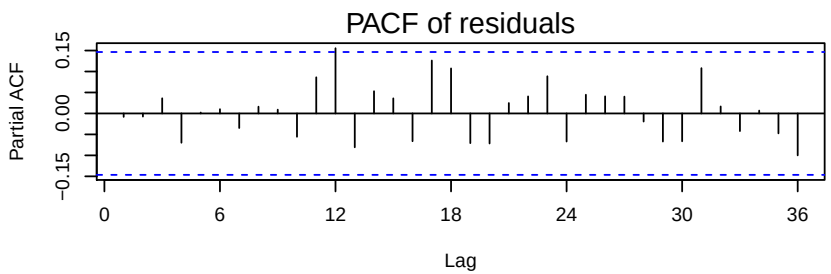
RegARIMA examples (2/3)

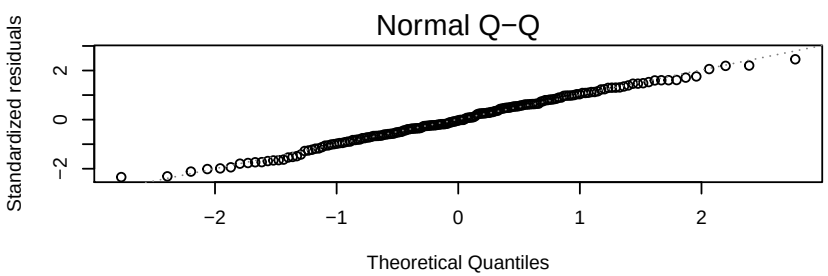
```
layout(matrix(1:6, 3, 2));plot(regarima_model, ask = FALSE)
```

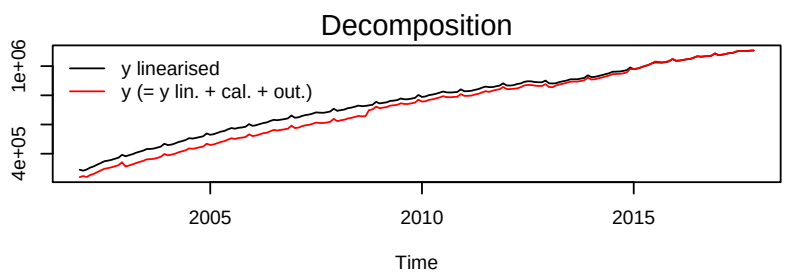








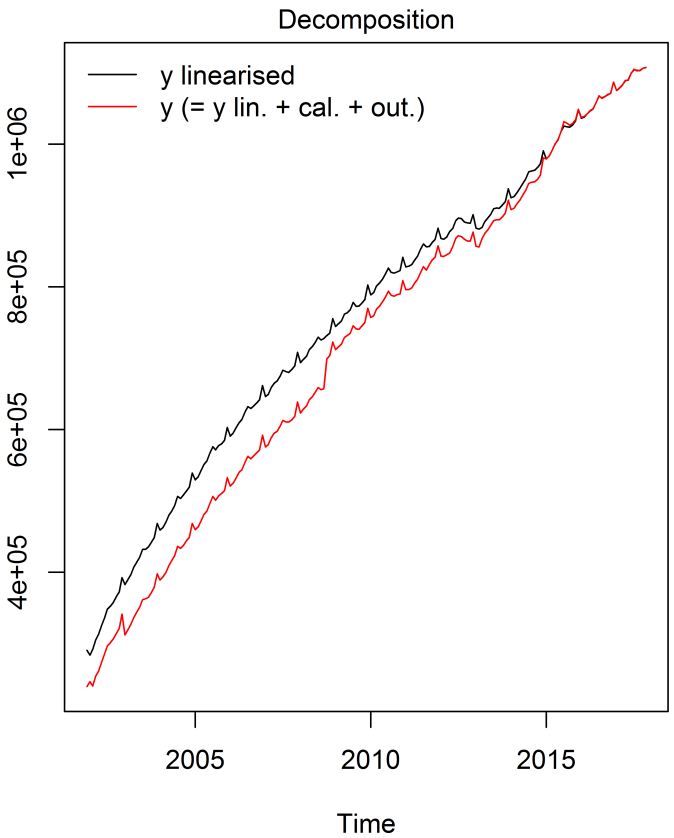


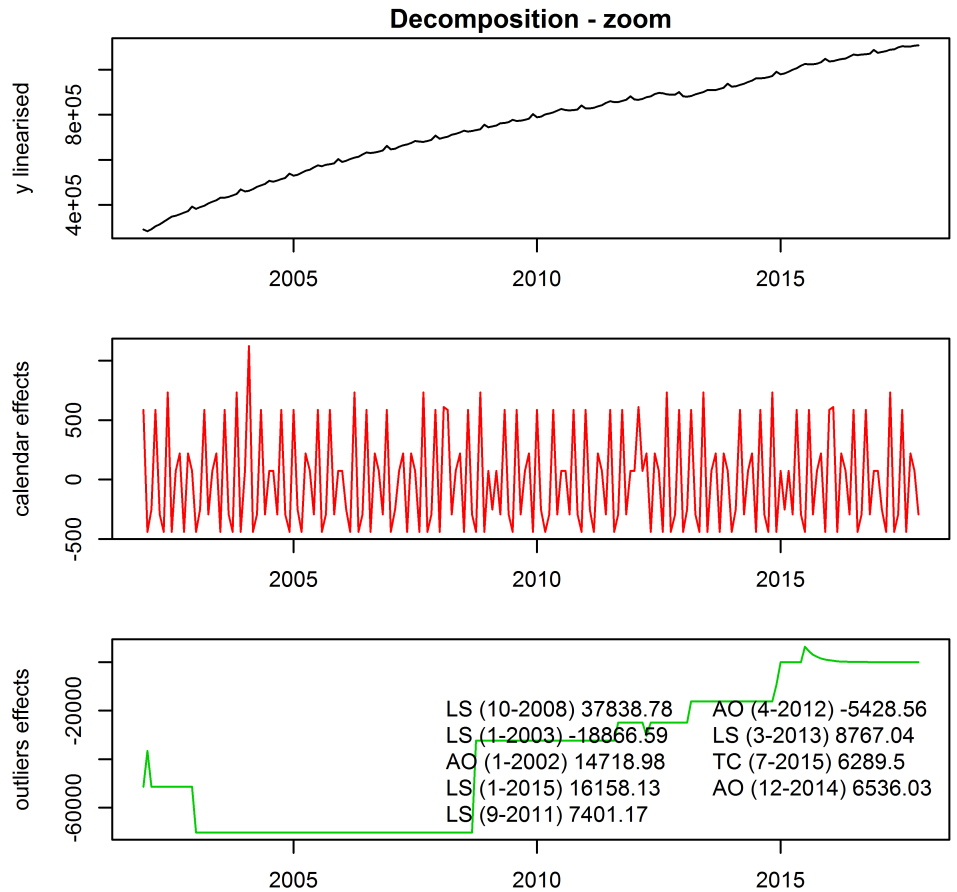


RegARIMA examples (3/3)

To select a specific graph `which` parameter; `dec_zoom` for an additional regarima decomposition graph:

```
plot(regarima_model, which = 6, dec_zoom = TRUE)
```





Seasonal adjustment examples (1/7)

A `SA` object is a `list()` of 5 elements:

1. `regarima`: the RegArima model
2. `decomposition`: decomposition variables ($\neq$ for TRAMO-SEATS and X-13-ARIMA)
3. `final`: time series main results
4. `diagnostics`: residuals tests, etc.
5. `user_defined`: other user_defined variables not exported by default (see `?user_defined_variables`)

```
x13_usr_spec <- x13_spec_def(spec=c("RSA5c"),usrdef.outliersEnabled = TRUE,
                             usrdef.outliersType = c("LS","AO"),
                             usrdef.outliersDate=c("2008-10-01","2002-01-01"),
                             usrdef.outliersCoef = c(36000,14000),
                             transform.function = "None")
x13_mod <- x13(myseries, x13_usr_spec)
ts_mod <- tramoseats_def(myseries, spec = "RSAfull")
```

Seasonal adjustment examples (2/7)

```
x13_mod$decomposition
```

```
## Monitoring and Quality Assessment Statistics:
##       M stats
## M(1)    0.026
## M(2)    0.011
## M(3)    0.000
## M(4)    0.423
## M(5)    0.000
## M(6)    0.095
## M(7)    0.188
## M(8)    0.356
## M(9)    0.128
## M(10)   0.385
## Q       0.144
## Q-M2    0.160
##
## Final filters:
## Seasonal filter:  3x5
## Trend filter:  9-Henderson
```

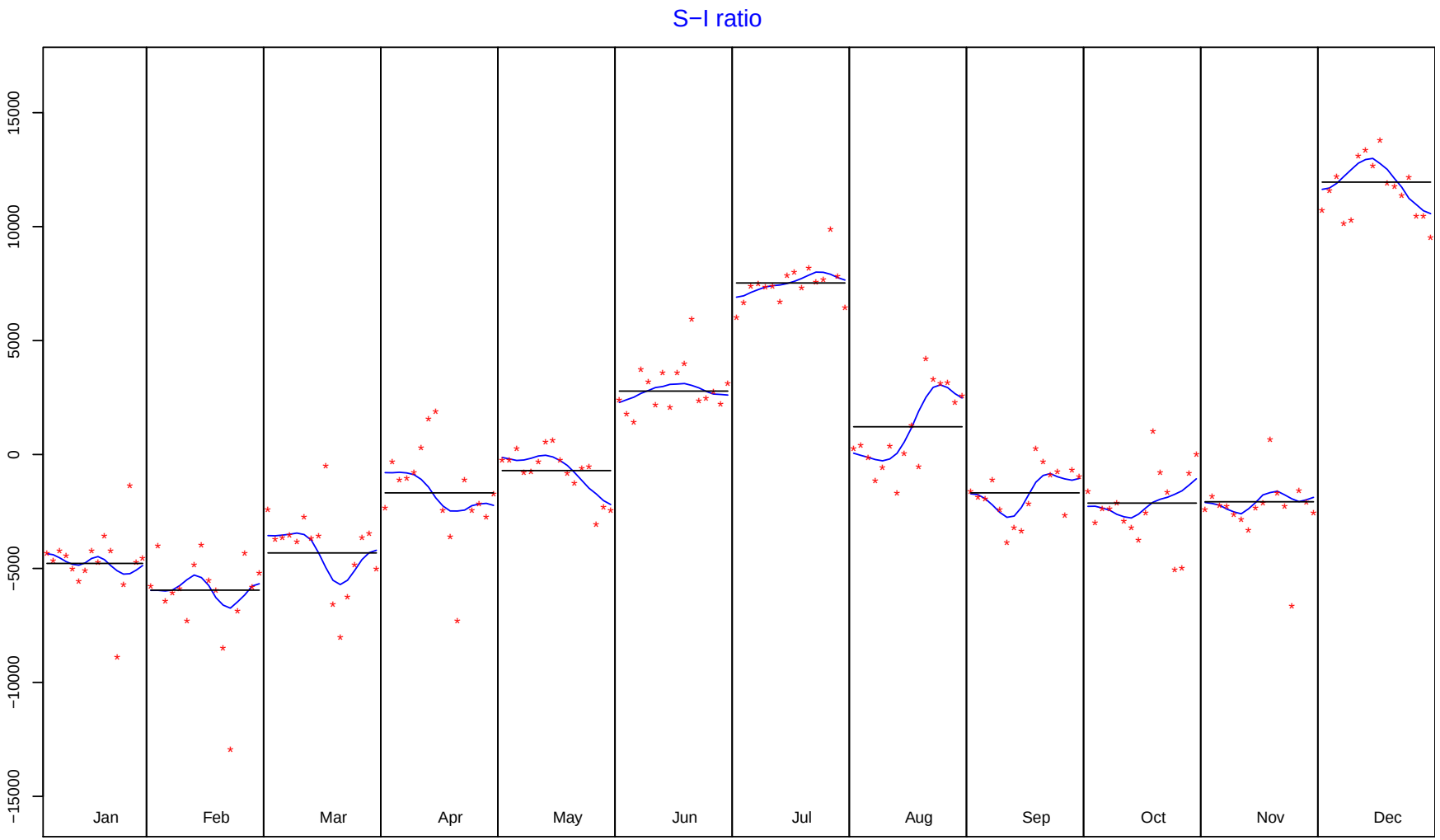
Seasonal adjustment examples (3/7)

```
print(ts_mod$decomposition, enable_print_style = FALSE)
```

```
## Model
## AR :  1 - 0.060534 B - 0.151535 B^2 - 0.346036 B^3 - 0.302623 B^12 + 0.018319
## D :  1 - B - B^12 + B^13
## MA :  1 - 0.950000 B^12
##
##
## SA
## AR :  1 - 0.965728 B - 0.096740 B^2 - 0.208867 B^3 + 0.313230 B^4
## D :  1 - 2.000000 B + B^2
## MA :  1 - 1.027671 B - 0.516726 B^2 + 0.212676 B^3 + 0.444341 B^4 + 0.015991
## Innovation variance:  0.1659023
##
## Trend
## AR :  1 - 1.701590 B + 0.720893 B^2
## D :  1 - 2.000000 B + B^2
## MA :  1 - 1.416543 B - 0.489305 B^2 + 1.416934 B^3 - 0.510304 B^4
## Innovation variance:  0.1113562
##
## Seasonal
## AR :  1 + 0.905194 B + 0.819377 B^2 + 0.741695 B^3 + 0.671378 B^4 + 0.607728
## D :  1 + B + B^2 + B^3 + B^4 + B^5 + B^6 + B^7 + B^8 + B^9 + B^10 + B^11
```

Seasonal adjustment examples (4/7)

```
plot(x13_mod$decomposition)
```



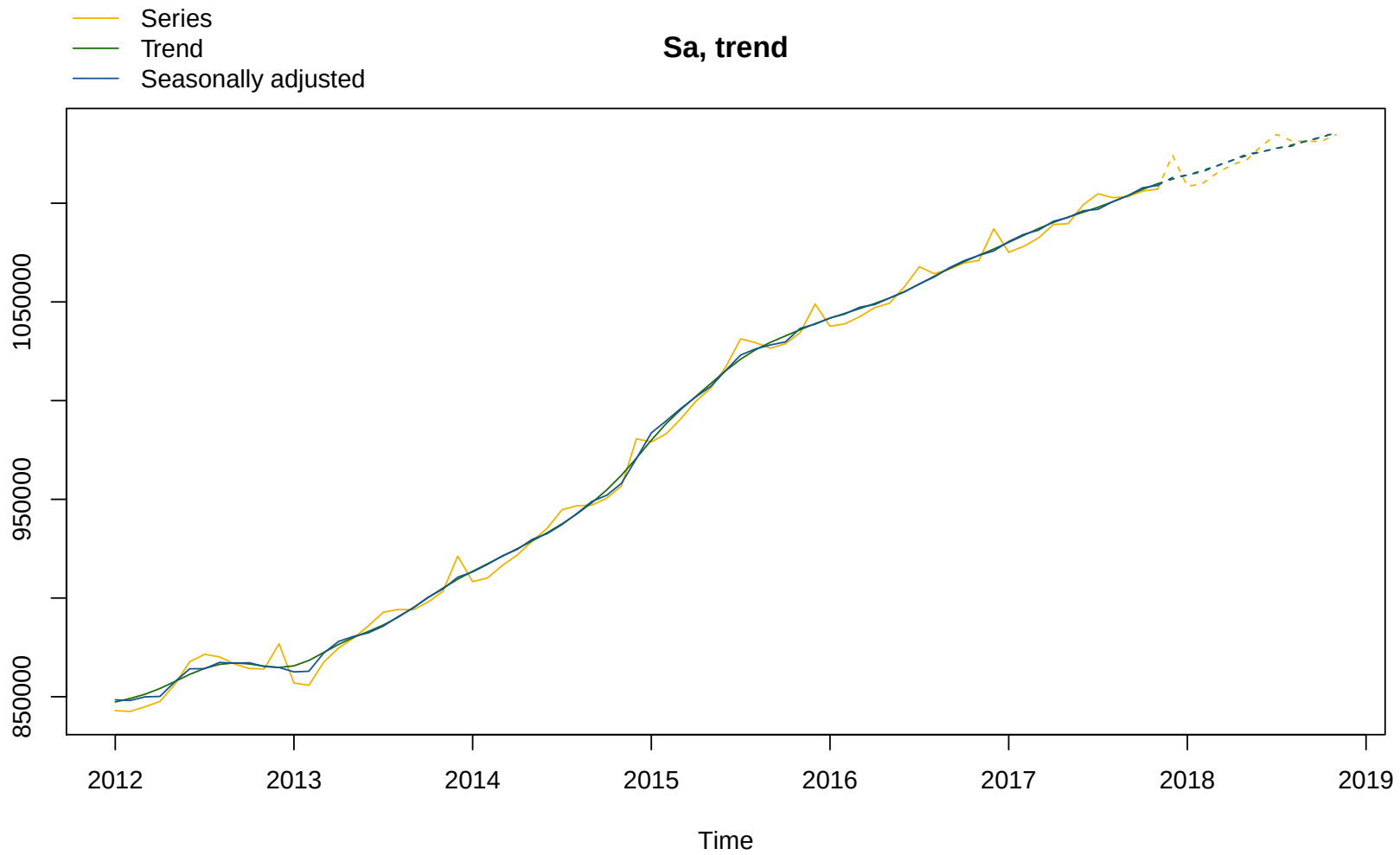
Seasonal adjustment examples (5/7)

```
x13_mod$final
```

```
## Last observed values
##                 y      sa       t           s           i
## Dec 2016 1087082 1075842 1076809 11240.0563  -966.92838
## Jan 2017 1075137 1080586 1080172 -5448.7173   413.95902
## Feb 2017 1078141 1084192 1083675 -6050.8123   516.52696
## Mar 2017 1082422 1086339 1087148 -3917.3376  -808.74611
## Apr 2017 1089204 1090829 1090257 -1625.1053   571.84127
## May 2017 1089662 1092839 1092962 -3177.2306  -122.51812
## Jun 2017 1099145 1096159 1095433  2985.8807   726.30641
## Jul 2017 1104797 1096917 1097978  7880.4569 -1061.84552
## Aug 2017 1102805 1100832 1100754  1972.7310    78.66638
## Sep 2017 1103295 1103768 1103873  -473.3715  -104.16916
## Oct 2017 1106170 1107814 1107030 -1643.7937   783.96096
## Nov 2017 1107118 1108997 1109863 -1879.3688  -865.76589
##
## Forecasts:
##                 y       sa        t           s           i
## Dec 2001 239720 227861.6 228866.4 11858.4223 -1004.78113
## Jan 2002 246680 251538.2 237528.5 -4858.1935 14009.64528
## Feb 2002 240476 246817.1 246601.3 -6341.1081   215.77338
## Mar 2002 254298 256967.3 255762.6 -2669.3308  1204.75400
```

Seasonal adjustment examples (6/7)

```
plot(x13_mod$final, first_date = 2012, type_chart = "sa-trend")
```



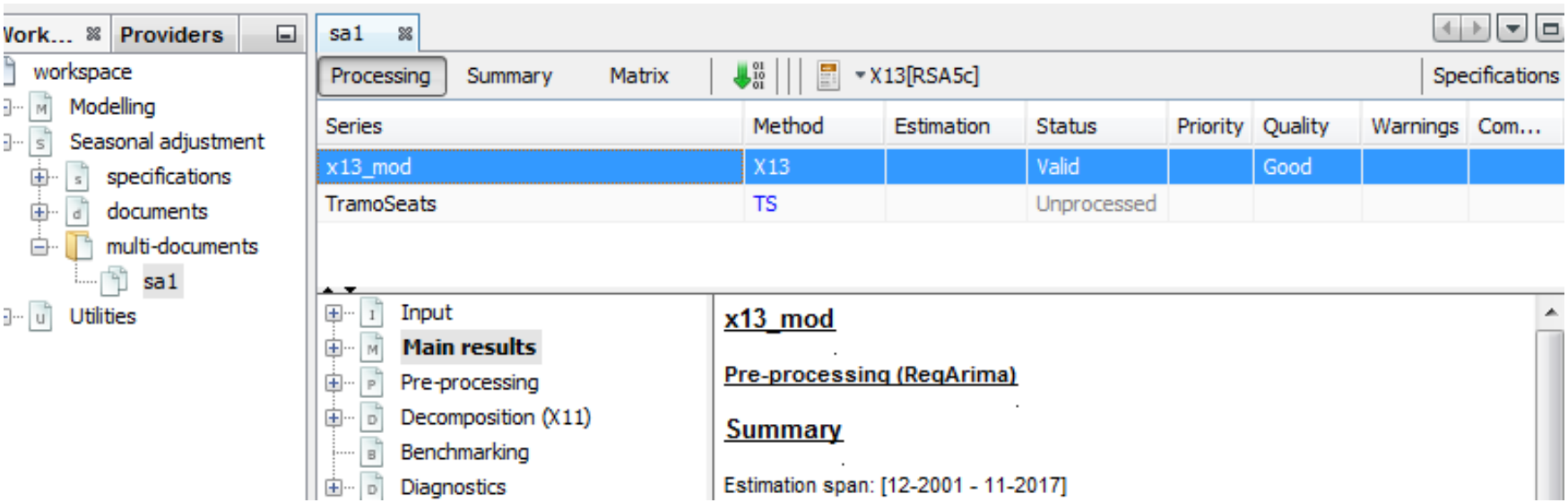
Seasonal adjustment examples (7/7)

```
print(x13_mod$diagnostics, enable_print_style = FALSE)
```

```
##  Relative contribution of the components to the stationary portion of the var
##  Trend computed by Hodrick-Prescott filter (cycle length = 8.0 years)
##             Component
##  Cycle         27.110
##  Seasonal       7.795
##  Irregular      0.382
##  TD & Hol.      0.114
##  Others        87.839
##  Total        123.240
##
##  Residual seasonality tests
##                                          P.value
##  qs test on sa                             1.000
##  qs test on i                              1.000
##  f-test on sa (seasonal dummies)           0.967
##  f-test on i (seasonal dummies)            0.854
##  Residual seasonality (entire series)      0.967
##  Residual seasonality (last 3 years)       0.967
##  f-test on sa (td)                         0.878
##  f-test on i (td)                          0.734
##
```

Export a workspace

```
wk <- new_workspace()
new_multiprocessing(wk, "sa1")
add_sa_item(wk, multiprocessing = "sa1",
            x13_mod)
add_sa_item(wk, multiprocessing = "sa1",
            ts_mod, "TramoSeats")
save_workspace(wk, "workspace.xml")
```



Import a workspace (1/3)

```
wk <- load_workspace("workspace.xml")
get_ts(wk)
```

```
## $sa1
## $sa1$x13_mod
##          Jan     Feb     Mar     Apr     May     Jun     Jul     Aug
## 2001
## 2002  246680  240476  254298  261655  273847  285696  296574  301114
## 2003  312120  319317  327218  336320  343756  351042  361475  362668
## 2004  389117  393469  399591  409373  416623  423014  436246  433400
## 2005  459893  463566  471751  481074  485829  496407  506284  500775
## 2006  520777  524765  532187  540257  543523  553658  562621  558909
## 2007  575640  578720  588522  594796  597610  604978  612926  610644
## 2008  623127  628987  632868  641391  645746  652087  658817  655993
## 2009  712199  715829  719841  729136  731911  734897  745341  741044
## 2010  757084  759517  768585  772608  778963  785493  793930  787969
## 2011  796249  796244  798344  805450  810435  819663  828194  823445
## 2012  842958  842541  844906  847598  856303  867744  871509  870166
## 2013  856975  855786  867536  874708  879698  885908  892804  894196
## 2014  908272  910194  916522  921814  928897  935294  944707  946755
## 2015  979087  983220  990949  999766 1006424 1017083 1031285 1029364
## 2016 1037667 1038867 1042518 1047084 1049349 1057708 1067801 1064305
## 2017 1075137 1078141 1082422 1089204 1089662 1099145 1104797 1102805
```

Import a workspace (2/3)

```
compute(wk) # Important to get the Sa model
models <- get_model(wk) # A progress bar is printed by default
```

```
## Multiprocessing 1 on 1:
##
  |
  |                                                                      |   0%
  |
  |================================                                      |  50%
  |
  |======================================================================| 100%
```

```
# To extract only one model
mp <- get_object(wk, 1)
count(mp)
```

```
## [1] 2
```

```
sa2 <- get_object(mp,2)
get_name(sa2)
```

```
## [1] "TramoSeats"
```

```
mod <- get_model(wk, sa2)
```

Import a workspace (3/3)

Still some bugs importing a workspace created by JDemetra+ when:

- The workspace contains user-defined trading days regressors
- The workspace contains an invalid model

How to install the package?

The package is available on github: https://github.com/nbbrd/rjdemetra

 To install it you need Java8: in case you don't, install a portable version of Java8 and set the `JAVA_HOME` path.

To install it use `devtools` or download the zip file

```
# install.packages("devtools")
devtools::install_github("nbbrd/rjdemetra",
                         args = "--no-multiarch")
```

How to contribute to the package?

You can contribute:

- Testing it and reporting issues (https://github.com/nbbrd/rjdemetra/issues)
- Correcting issues (https://github.com/nbbrd/rjdemetra/pulls)
- Developping new tools (other packages, new functions, etc.)

What's next?

- Possibility to used user-defined calendar regressors
- `update` function to refresh a model with new data
- Include a "complete" dataset in the package
- Write a vignette (long-form guide to the package) or an article in the Journal of Statistical Software
- More tests on the package

Sommaire

1. RJDemetra

2. One addin example: rdjqa

2.1 What for?

2.2 Statistics Canada dashboard

What for?

A package for quality assessment for seasonal adjustment. It implements:

- Statistics Canada Dashboard (to provide a snapshot of an individual series at a point in time and points out some possible problems)
- Insee quality report matrix (used to help the analyst during production to prioritize the models to check)

$\rightarrow$ See the Seasonal Adjustment handbook

Available on github https://github.com/AQLT/rjdqa, still in development (only works for X13 models and no documentation yet)

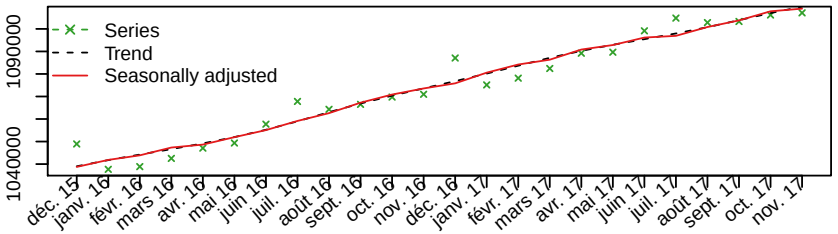
Example of the dashboard:

```
library(rjdqa)
plot(sa_dashboard(x13_mod))
```

Example of the dashboard (1/2)

Seasonal Adjustment Dashboard

Recent History



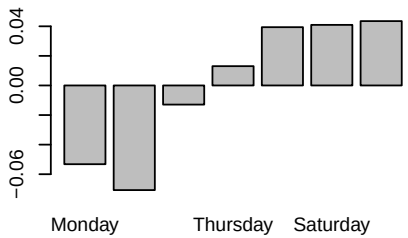
Reference Month: 2017−11

Summary of Key Diagnostics

	Value	Indicator
Adjustability (M7)	0.19	
Residual Seasonality (qs−test on sa)	1.00	
Residual Seasonality (f−test on sa)	0.97	
Residual Trading−days effects (f−test on sa)	0.88	
ARIMA autocorrelation (lb test)	0.42	
Recent Outliers (current period)	Regular	
Recent Outliers (previous period)	Regular	

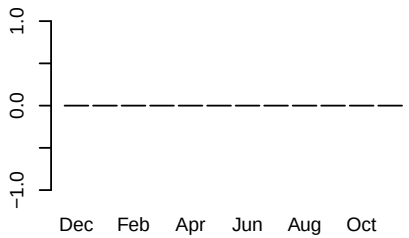
Net Effect of Seasonal Adjustment

Trading Day Pattern



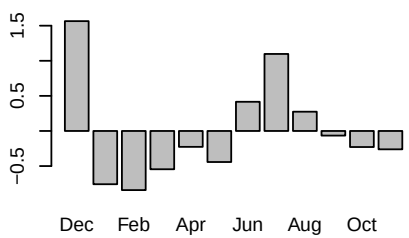
Trading Day Effects: ⇑ expected
Previous Month −0.1%
Current Month +0.0%

Moving Holiday Pattern



Moving Holiday Effects: ⇒ expected
Previous Month +0.0%
Current Month +0.0%

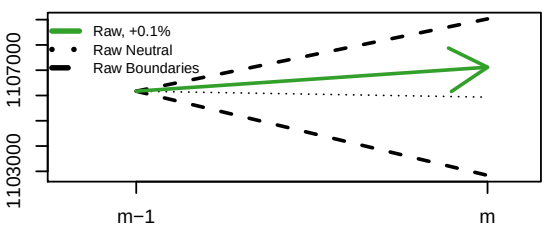
Seasonal Pattern



Seasonal Effects: ⇑ expected
Previous Month −0.2%
Current Month −0.3%

Estimated Patterns and Anticipated Movements

Unadjusted (Raw)

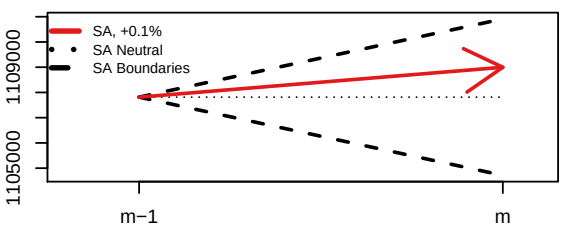


Observed 0.1% raw increase from last month

Neutral result requires 0.0% raw decrease from last month:

Trading day effects represent 0.1% raw increase
No moving holiday effect
Seasonal effects represent 0.1% raw decrease

Seasonally Adjusted (SA)



Example of the dashboard (2/2)

1. **Recent History of Series**: plot of the raw series, the SA series and the trend for the most recent periods. It is intended to identify trend direction, overall volatility and obvious outliers
2. **Summary of Key Diagnostics**: key diagnostics as residual seasonality, recent and recurring outliers, moving seasonality, ARIMA model autocorrelation
3. **Estimated Patterns and Anticipated Movements**: estimated trading day, moving holiday and seasonal pattern (rescaled in additive decomposition to represent relative level)
4. **Net Effect of Seasonal Adjustment**: movement in the raw series, compared to typical ranges centered around "neutral" value (when $SA_t = SA_{t-1}$)