rjdmarkdown with PDF output

The functions developped in `rjdmarkdown` are:

- `print_preprocessing()` for the pre-processing model;
- `print_decomposition()` for the decomposition;
- `print_diagnostics()` to print diagnostics tests on the quality of the seasonal adjustment.

The result is different between X-13ARIMA and TRAMO-SEATS models.

```
library(rjdmarkdown)
library(RJDemetra)
sa_x13 <- x13(ipi_c_eu[, "FR"])
sa_ts <- tramoseats(ipi_c_eu[, "FR"])
```

X-13-ARIMA model

```
print_preprocessing(sa_x13)
```

Pre-processing (RegArima)

Summary

349 observations

Trading days effect (7 variables)

Easter [1] detected

3 detected outliers

Likelihood statistics

Number of effective observations = 336

Number of estimated parameters = 14

Loglikelihood = -646.654, AICc = 1322.617, BICc = 1.225

Standard error of the regression (ML estimate) = 1.649

ARIMA model

Table 1: ARIMA coefficients

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Theta(1)	-0.522	0.047	-10.987	0.000	***
BTheta(1)	-0.496	0.049	-10.151	0.000	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

ARIMA (0,1,1)(0,1,1)

Regression model

Table 2: Regression coefficientss

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Monday	-0.216	0.159	-1.356	0.176	
Tuesday	0.026	0.159	0.163	0.871	
Wednesday	0.255	0.159	1.607	0.109	
Thursday	-0.568	0.159	-3.575	0.000	***
Friday	0.430	0.159	2.707	0.007	**
Saturday	0.196	0.158	1.242	0.215	
Leap year	-0.043	0.496	-0.086	0.931	
Easter [1]	-0.922	0.321	-2.875	0.004	**
LS (11-2008)	-8.506	1.300	-6.546	0.000	***
LS (1-2009)	-7.223	1.299	-5.559	0.000	***
LS (5-2008)	-4.980	1.252	-3.977	0.000	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
print_decomposition(sa_x13, caption = NULL)
```

Decomposition (X-11)

Mode: additive

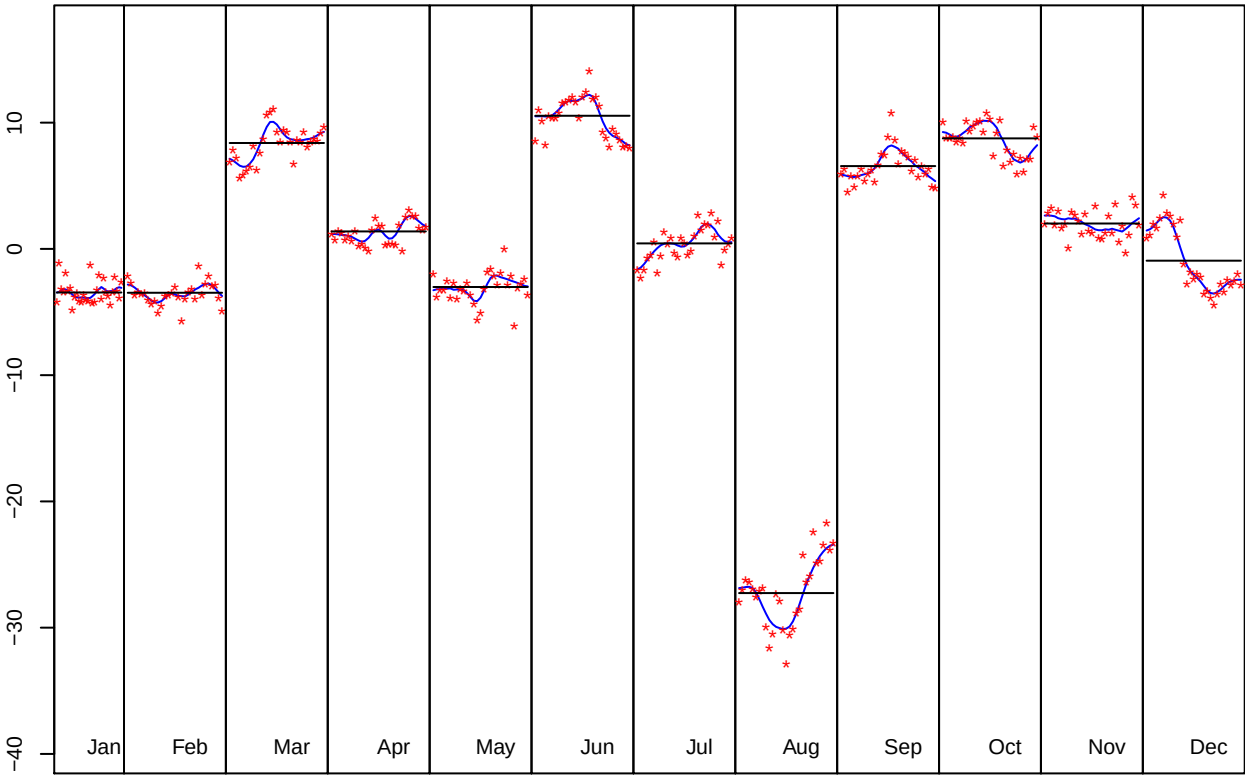

Figure 1: S-I Ratio

Table 3: M-statistics

	Value	Description
M-1	0.062	The relative contribution of the irregular over three months span
M-2	0.036	The relative contribution of the irregular component to the stationary portion of the variance
M-3	0.777	The amount of period to period change in the irregular component as compared to the amount of period to period change in the trend
M-4	0.329	The amount of autocorrelation in the irregular as described by the average duration of run
M-5	0.700	The number of periods it takes the change in the trend to surpass the amount of change in the irregular
M-6	0.261	The amount of year to year change in the irregular as compared to the amount of year to year change in the seasonal
M-7	0.074	The amount of moving seasonality present relative to the amount of stable seasonality
M-8	0.208	The size of the fluctuations in the seasonal component throughout the whole series
M-9	0.056	The average linear movement in the seasonal component throughout the whole series
M-10	0.197	The size of the fluctuations in the seasonal component in the recent years
M-11	0.194	The average linear movement in the seasonal component in the recent years
Q	0.265	
Q-M2	0.293	

Final filters: M3x5, Henderson-13 terms

Table 4: Relative contribution of the components to the stationary portion of the variance in the original series, after the removal of the long term trend

	Component
Cycle	1.575
Seasonal	48.447
Irregular	0.396
TD & Hol.	0.056
Others	50.960
Total	101.435

```
print_diagnostics(sa_x13)
```

Table 5: Diagnostics tests

	$\mathbb{P}(>\|t\|)$	
mean	0.835	
skewness	0.656	
kurtosis	0.018	*
ljung box	0.038	*
ljung box (residuals at seasonal lags)	0.945	
ljung box (squared residuals)	0.360	
qs test on sa	1.000	
qs test on i	1.000	
f-test on sa (seasonal dummies)	0.982	
f-test on i (seasonal dummies)	0.927	
Residual seasonality (entire series)	0.988	
Residual seasonality (last 3 years)	0.784	
f-test on sa (td)	0.978	
f-test on i (td)	1.000	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

TRAMO-SEATS model

Some others graphics can also be added with the `ggdemetra` package, for example to add the seasonally adjusted series and its forecasts:

```
library(ggdemetra)
ggplot(data = ipi_c_eu_df, mapping = aes(x = date, y = FR)) +
    geom_line() +
    labs(title = NULL,
         x = NULL, y = NULL) +
    geom_sa(component = "y_f", linetype = 2,
            frequency = 12, method = "tramoseats") +
    geom_sa(component = "sa", color = "red") +
    geom_sa(component = "sa_f", color = "red", linetype = 2)
```

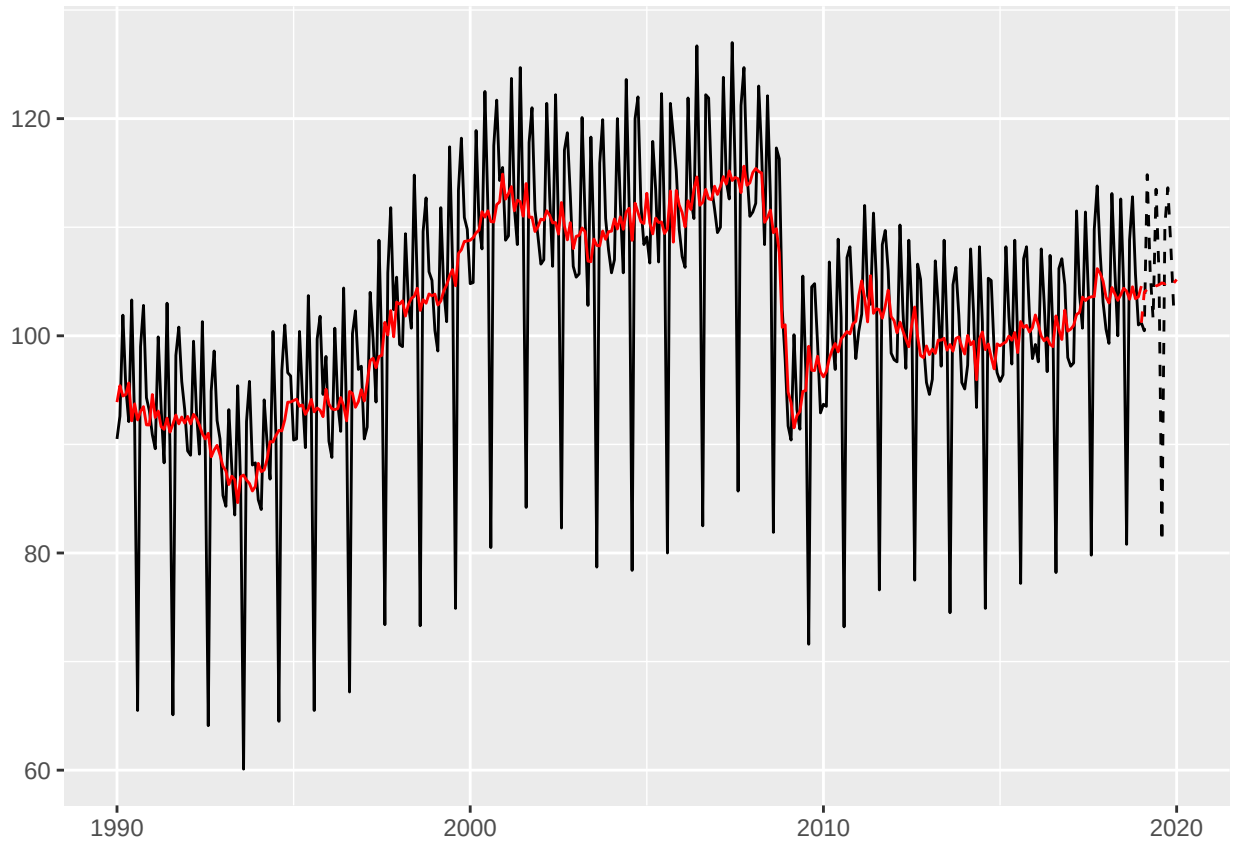

Figure 2: Seasonal adjustment of the French industrial production index

```
print_preprocessing(sa_ts)
```

Pre-processing (Tramo)

Summary

349 observations

Series has been log-transformed

Trading days effect (6 variables)

Easter [6] detected

5 detected outliers

Likelihood statistics

Number of effective observations = 335

Number of estimated parameters = 16

Loglikelihood = 915.575, AICc = 1297.078, BICc = -8.085

Standard error of the regression (ML estimate) = 0.015

ARIMA model

Table 6: ARIMA coefficients

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Theta(1)	-1.452	0.050	-28.990	0.000	***
Theta(2)	0.453	0.050	9.038	0.000	***
BTheta(1)	-0.586	0.047	-12.394	0.000	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
ARIMA (0,2,2)(0,1,1)

Regression model

Table 7: Regression coefficientss

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Monday	-0.003	0.002	-2.200	0.029	*
Tuesday	0.000	0.002	0.330	0.741	
Wednesday	0.004	0.002	2.704	0.007	**
Thursday	-0.006	0.002	-4.196	0.000	***
Friday	0.004	0.002	2.449	0.015	*
Saturday	0.002	0.002	1.247	0.213	
Easter [6]	-0.010	0.003	-3.200	0.002	**
LS (11-2008)	-0.081	0.013	-6.297	0.000	***
LS (1-2009)	-0.070	0.013	-5.456	0.000	***
AO (8-2001)	0.053	0.012	4.258	0.000	***
AO (5-2011)	0.039	0.012	3.200	0.002	**
AO (8-2002)	0.043	0.012	3.450	0.001	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
print_decomposition(sa_ts, caption = NULL)
```

Decomposition (SEATS)

Mode: multiplicative

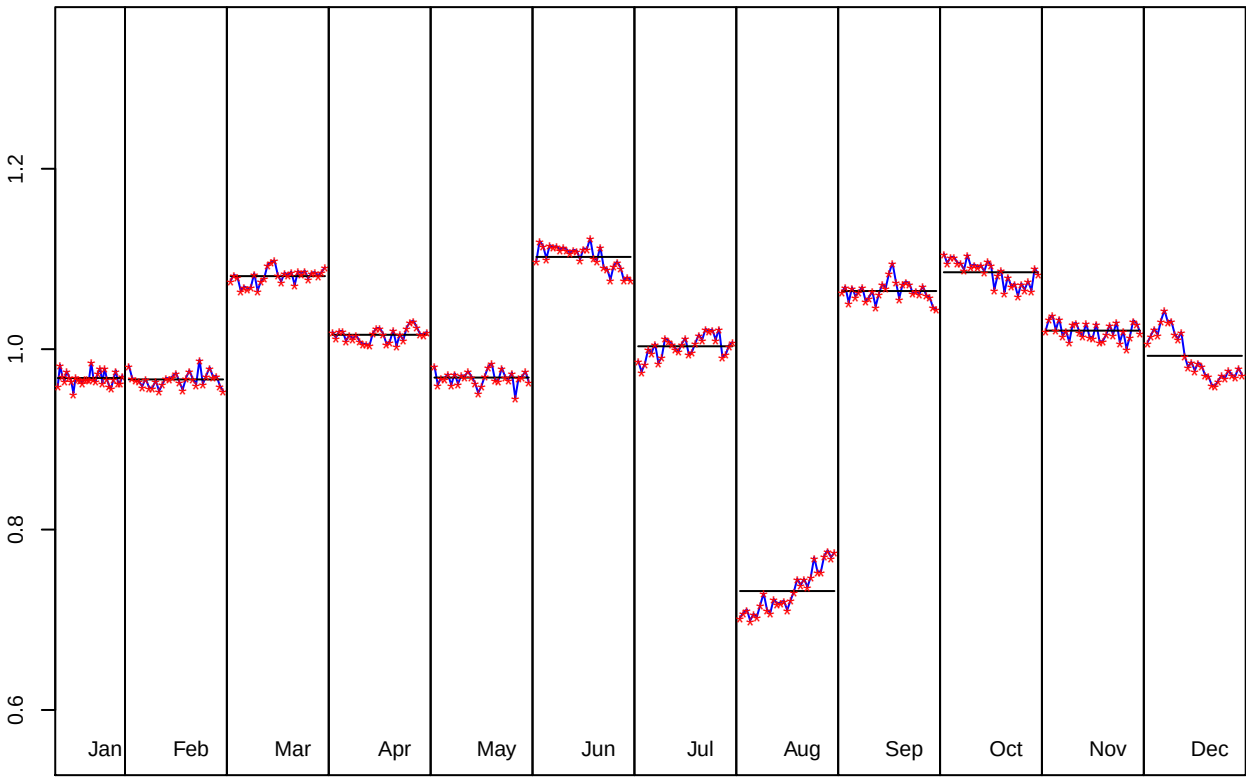

Figure 3: S-I Ratio

Model

D: $1 - 2.000B + B^2 - B^{12} + 2.000B^{13} - B^{14}$

MA: $1 - 1.403B + 0.430B^2 - 0.586B^{12} + 0.822B^{13} - 0.252B^{14}$

SA

D: $1 - 3.000B + 3.000B^2 - B^3$

MA: $1 - 2.368B + 1.789B^2 - 0.420B^3$

Innovation variance: 0.649

Trend

D: $1 - 3.000B + 3.000B^2 - B^3$

MA: $1 - 0.907B - 0.998B^2 + 0.909B^3$

Innovation variance: 0.047

Seasonal

D: $1 + B + B^2 + B^3 + B^4 + B^5 + B^6 + B^7 + B^8 + B^9 + B^{10} + B^{11}$

MA: $1 + 1.349B + 1.381B^2 + 1.283B^3 + 1.078B^4 + 0.833B^5 + 0.575B^6 + 0.326B^7 + 0.119B^8 - 0.072B^9 - 0.199B^{10} - 0.470B^{11}$

Innovation variance: 0.043

Irregular

Innovation variance: 0.316

Table 8: Relative contribution of the components to the stationary portion of the variance in the original series, after the removal of the long term trend

	Component
Cycle	1.976
Seasonal	65.934
Irregular	0.268
TD & Hol.	0.075
Others	31.930
Total	100.183

```
print_diagnostics(sa_ts)
```

Table 9: Diagnostics tests

	$\mathbb{P}(>\|t\|)$	
mean	0.649	
skewness	0.845	
kurtosis	0.788	
ljung box	0.008	**
ljung box (residuals at seasonal lags)	1.000	
ljung box (squared residuals)	0.291	
qs test on sa	1.000	
qs test on i	1.000	
f-test on sa (seasonal dummies)	1.000	
f-test on i (seasonal dummies)	1.000	
Residual seasonality (entire series)	1.000	
Residual seasonality (last 3 years)	0.941	
f-test on sa (td)	0.912	
f-test on i (td)	0.999	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Directly create a R Markdown file

A R Markdown can also directly be created and render with the `create_rmd` function. It can take as argument a `SA`, `jSA`, `sa_item`, `multiprocessing` (all the models of the `multiprocessing` are printed) or workspace object (all the models of all the `multiprocessing` of the `workspace` are printed).

The print of the pre-processing, decomposition and diagnostics can also be customized with `preprocessing_fun`, `decomposition_fun` and `diagnostics_fun` arguments. For example, to reproduce the example of the previous section:

```
preprocessing_customized <- function(x){
  library(ggdemetra)
  y <- get_ts(x)
  data_plot <- data.frame(date = time(y), y = y)
  p <- ggplot(data = data_plot, mapping = aes(x = date, y = y)) +
    geom_line() +
    labs(title = NULL,
```

```
         x = NULL, y = NULL) +
    geom_sa(component = "y_f", linetype = 2,
            frequency = 12, method = "tramoseats") +
    geom_sa(component = "sa", color = "red") +
    geom_sa(component = "sa_f", color = "red", linetype = 2)
  plot(p)
  cat("\n\n")
  print_preprocessing(sa_ts)
}
decomposition_customized <- function(x){
  print_decomposition(x, caption = NULL)
}

output_file <- tempfile(fileext = ".Rmd")

create_rmd(sa_ts, output_file, output_format = "pdf_document",
           preprocessing_fun = preprocessing_customized,
           decomposition_fun = decomposition_customized,
           knitr_chunk_opts = list(
             fig.pos = "h", results = "asis",
             fig.cap =c("Seasonal adjustment of the French industrial production index",
                        "S-I Ratio"),
             warning = FALSE, message = FALSE, echo = FALSE)
           )
# To open the file:
browseURL(sub(".Rmd",".pdf", output_file, fixed= TRUE))
```

Several models can also be printed creating a workspace:

```
wk <- new_workspace()
new_multiprocessing(wk, "sa1")
add_sa_item(wk, "sa1", sa_x13, "X13")
add_sa_item(wk, "sa1", sa_ts, "TramoSeats")
# It's important to compute the workspace to be able to import the models
compute(wk)

output_file <- tempfile(fileext = ".Rmd")
create_rmd(wk, output_file, output_format = "pdf_document",
           output_options = list(toc = TRUE,
                                 number_sections = TRUE))
# To open the file:
browseURL(sub(".Rmd",".pdf", output_file, fixed= TRUE))
```

Reproductibility

For PDF outputs, the following package must be used.

```
header-includes:
   - \usepackage{booktabs}
   - \usepackage{float}
   - \usepackage{array}
   - \usepackage{multirow}
   - \floatplacement{figure}{H}
```

To produce this document, the `knitr` options were set as followed:

```
knitr::opts_chunk$set(collapse = TRUE,
  comment = "#>", fig.pos = "h",
  warning = FALSE, message = FALSE
)
```

And the options `results='asis', fig.cap = "S-I Ratio"` were used in the chunks.