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

360 observations

Series has been log-transformed

Trading days effect (6 variables)

Easter [1] detected

3 detected outliers

Likelihood statistics

Number of effective observations = 347

Number of estimated parameters = 15

Loglikelihood = 853.667, AICc = 1529.651, BICc = -7.547

Standard error of the regression (ML estimate) = 0.020

ARIMA model

Table 1: ARIMA coefficients

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Phi(1)	0.026	0.118	0.218	0.827	
Phi(2)	0.159	0.078	2.039	0.042	*
Theta(1)	-0.517	0.113	-4.589	0.000	***
BTheta(1)	-0.703	0.041	-17.093	0.000	***

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

Regression model

Table 2: Regression coefficientss

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Monday	0.005	0.002	2.309	0.022	*
Tuesday	0.008	0.002	3.895	0.000	***
Wednesday	0.011	0.002	4.903	0.000	***
Thursday	0.002	0.002	0.955	0.340	
Friday	0.008	0.002	3.826	0.000	***
Saturday	-0.016	0.002	-7.599	0.000	***
Easter [1]	-0.021	0.004	-4.979	0.000	***
AO (5-2011)	0.128	0.017	7.447	0.000	***
LS (11-2008)	-0.087	0.017	-5.131	0.000	***
LS (1-2009)	-0.068	0.017	-4.037	0.000	***

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

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

Decomposition (X-11)

Mode: multiplicative

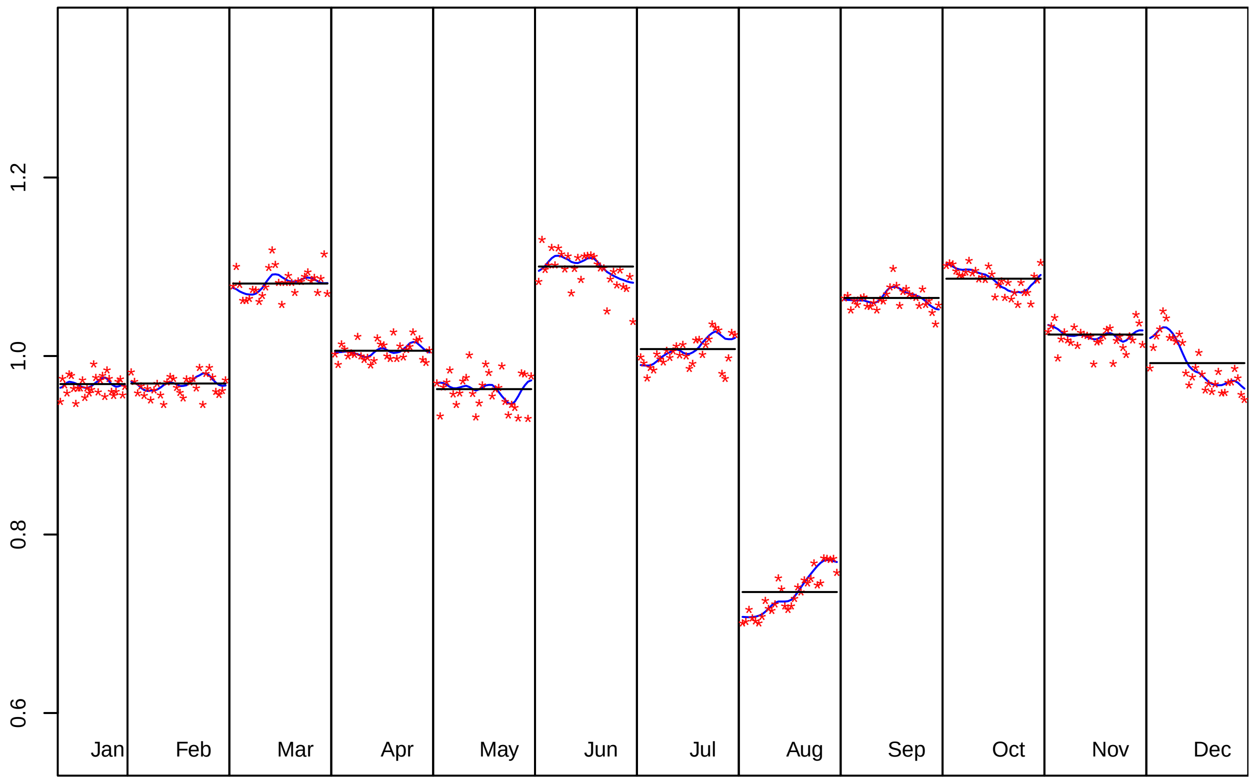

Figure 1: S-I Ratio

Table 3: M-statistics

	Value	Description
M-1	0.097	The relative contribution of the irregular over three months span
M-2	0.053	The relative contribution of the irregular component to the stationary portion of the variance
M-3	0.995	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	0.421	The amount of autocorrelation in the irregular as described by the average duration of run
M-5	0.950	The number of periods it takes the change in the trend to surpass the amount of change in the irregular
M-6	0.154	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	0.211	The size of the fluctuations in the seasonal component throughout the whole series
M-9	0.064	The average linear movement in the seasonal component throughout the whole series
M-10	0.267	The size of the fluctuations in the seasonal component in the recent years
M-11	0.250	The average linear movement in the seasonal component in the recent years
Q	0.322	
Q-M2	0.355	

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	1.941
Seasonal	62.123
Irregular	0.842
TD & Hol.	2.428
Others	32.787
Total	100.121

```
print_diagnostics(sa_x13)
```

Table 5: Diagnostics tests

	$\mathbb{P}(>\|t\|)$	
mean	0.797	
skewness	0.383	
kurtosis	0.409	
ljung box	0.000	***
ljung box (residuals at seasonal lags)	0.199	
ljung box (squared residuals)	0.802	
qs test on sa	0.909	
qs test on i	0.746	
f-test on sa (seasonal dummies)	0.974	
f-test on i (seasonal dummies)	0.947	
Residual seasonality (entire series)	0.932	
Residual seasonality (last 3 years)	0.940	
f-test on sa (td)	0.985	
f-test on i (td)	0.983	

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:

```r
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)
```

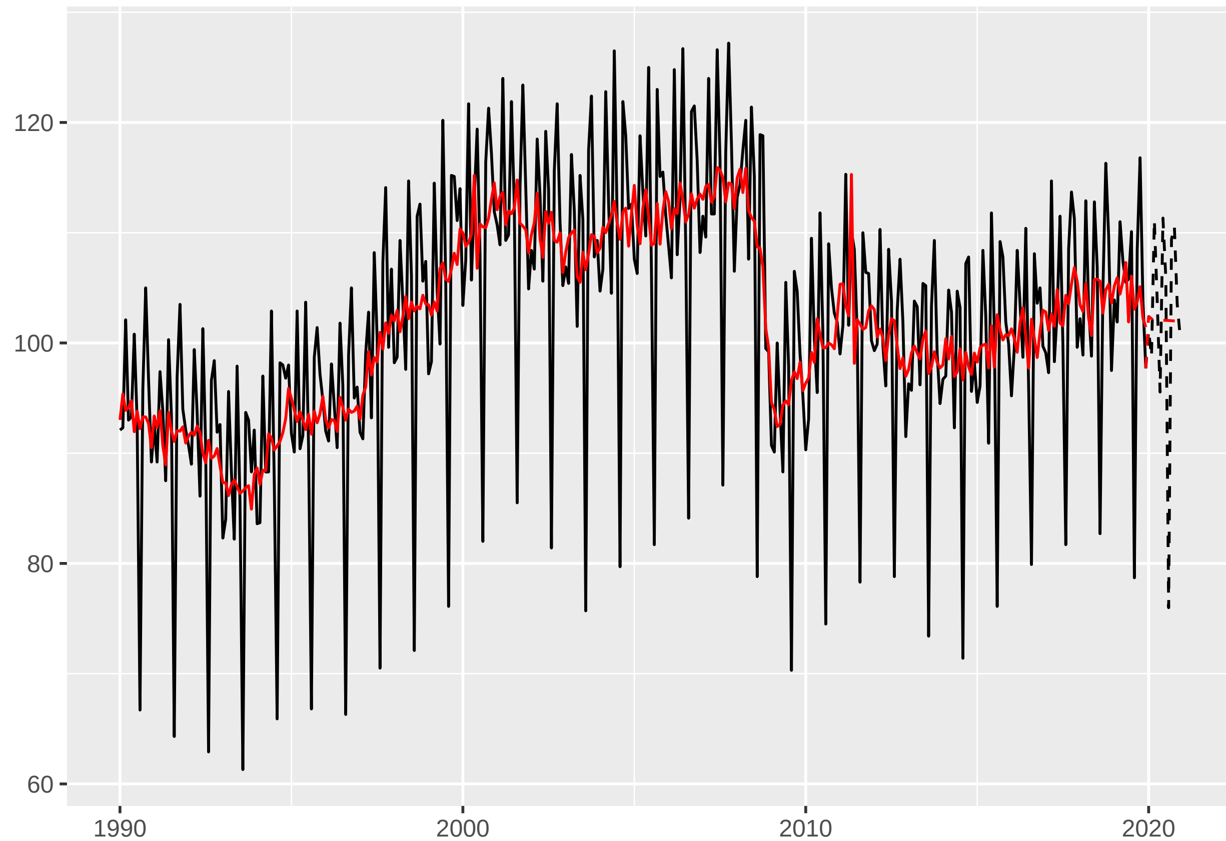

Figure 2: Seasonal adjustment of the French industrial production index

```r
print_preprocessing(sa_ts)
```

Pre-processing (Tramo)

Summary

360 observations

Series has been log-transformed

Trading days effect (2 variables)

Easter [6] detected

2 detected outliers

Likelihood statistics

Number of effective observations = 347

Number of estimated parameters = 9

Loglikelihood = 831.828, AICc = 1560.412, BICc = -7.523

Standard error of the regression (ML estimate) = 0.022

ARIMA model

Table 6: ARIMA coefficients

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Phi(1)	0.386	0.053	7.287	0.000	***
Phi(2)	0.243	0.053	4.579	0.000	***
BTheta(1)	-0.713	0.040	-17.672	0.000	***

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

Regression model

Table 7: Regression coefficientss

	Coefficients	Std. Error	T-stat	$\mathbb{P}(>\|t\|)$	
Week days	0.007	0.000	23.891	0.000	***
Leap year	0.022	0.007	3.238	0.001	**
Easter [6]	-0.021	0.004	-5.118	0.000	***
AO (5-2011)	0.129	0.017	7.640	0.000	***
AO (5-2000)	0.058	0.017	3.409	0.001	***

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

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

Decomposition (SEATS)

Mode: multiplicative

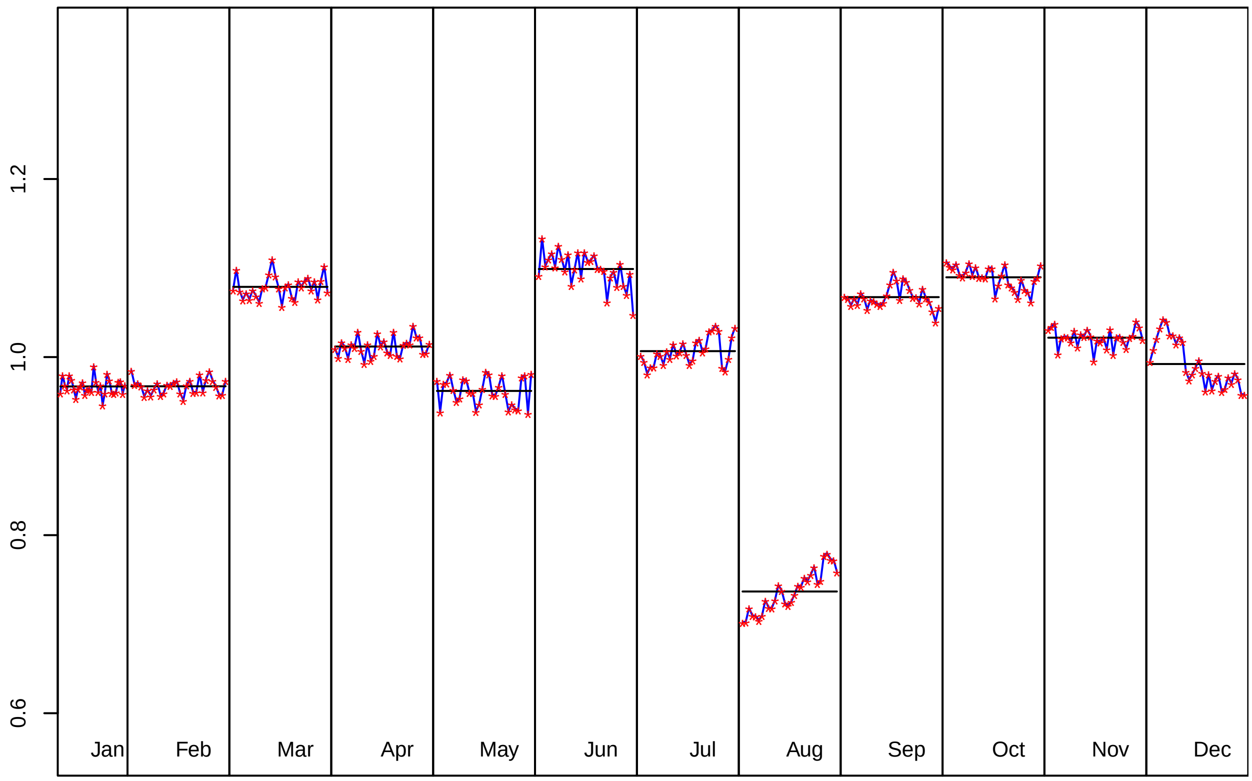

Figure 3: S-I Ratio

Model

AR: $1 + 0.386B + 0.243B^2$

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

MA: $1 - 0.713B^{12}$

SA

AR: $1 + 0.386B + 0.243B^2$

D: $1 - 2.000B + B^2$

MA: $1 - 0.975B + 0.004B^2 - 0.003B^3 + 0.002B^4$

Innovation variance: 0.747

Trend

D: $1 - 2.000B + B^2$

MA: $1 + 0.028B - 0.972B^2$

Innovation variance: 0.070

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: $1 + 1.353B + 1.194B^2 + 1.260B^3 + 1.124B^4 + 0.886B^5 + 0.683B^6 + 0.440B^7 + 0.272B^8 + 0.020B^9 - 0.055B^{10} - 0.222B^{11}$

Innovation variance: 0.030

Transitory

AR: $1 + 0.386B + 0.243B^2$

MA: $1 - 0.316B - 0.684B^2$

Innovation variance: 0.052

Irregular

Innovation variance: 0.222

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	5.694
Seasonal	88.840
Irregular	0.820
TD & Hol.	3.412
Others	0.469
Total	99.234

```r
print_diagnostics(sa_ts)
```

Table 9: Diagnostics tests

	$\mathbb{P}(>\lvert t\rvert)$	
mean	0.933	
skewness	0.323	
kurtosis	0.237	
ljung box	0.001	***
ljung box (residuals at seasonal lags)	0.197	
ljung box (squared residuals)	0.002	**
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)	0.984	
f-test on sa (td)	0.135	
f-test on i (td)	0.256	

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:

```r
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:

```r
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.