

Package ‘disaggR’

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Type Package

Title Two-Steps Benchmarks for Time Series Disaggregation

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Description The twoStepsBenchmark() and threeRuleSmooth() functions allow you to disaggregate a low-frequency time-series with higher frequency time-series, using the French National Accounts methodology. The aggregated sum of the resulting time-series is strictly equal to the low-frequency serie within the benchmarking window. Typically, the low-frequency serie is an annual one, unknown for the last year, and the high frequency one is either quarterly or mensual. See “Methodology of quarterly national accounts”, Insee Méthodes N°126, by Insee (2012, ISBN:978-2-11-068613-8).

Imports graphics, grDevices, methods, RColorBrewer (>= 1.1-2), stats, utils

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bf1Smooth	<i>Smooth a time serie</i>
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Description

bf1Smooth smoothes a time-serie into a time serie of a higher frequency that exactly aggregates into the higher one. The process followed is Boot, Feibes and Lisman, which minimizes the squares of the variations.

Usage

```
bf1Smooth(lfserie, nfrequency, weights = NULL, lfserie.is.rate = FALSE)
```

Arguments

lfserie	a time-serie to be smoothed
nfrequency	the new high frequency. It must be a multiple of the low frequency.
weights	NULL or a time-serie of the same size than the expected high-frequency serie.
lfserie.is.rate	TRUE or FALSE. only means a thing if weights isn't NULL.

Details

If `weights` isn't NULL the results depends of `lfserie.is.rate` :

- if FALSE the rate output/weights is smoothed with the constraint that the aggregated output is equal to the input `lfserie`.
- if TRUE the input `lfserie` is the rate to be smoothed, with the constraint that the low-frequency weighted means of the output are equal to `lfserie`.

Value

A time serie of frequency `nfrequency`

distance	<i>Distance computation for disaggregations</i>
----------	---

Description

This function `distance` computes the Minkowski distance of exponent `p`, related to a `tscomparison` object, produced with `in_sample`, `in_disaggr` or `in_revisions`

Usage

```
distance(x, p = 2)
```

Arguments

<code>x</code>	an object of class <code>tscomparison</code>
<code>p</code>	an integer greater than 1L, or Inf.

Details

The meaning depends on the `tscomparison` function :

- `in_sample` will produce the low-frequency distance between the predicted value and the response, on the coefficient calculation window.
- `in_disaggr` will produce the high-frequency distance between the inputs (eventually, the sum of its contributions) and the benchmarked serie.
- `in_revisions` will produce the high-frequency distance between the two benchmarked series (contributions distance isn't permitted).

Value

a numeric of length 1, the distance.

See Also

`in_sample` `in_disaggr` `in_revisions`

Examples

```
benchmark <- twoStepsBenchmark(turnover,construction,include.rho = TRUE)
distance(in_sample(benchmark,type="changes"))
distance(in_disaggr(benchmark,type="contributions"),p=1L)
distance(in_disaggr(benchmark,type="changes"),p=Inf)
```

in_disaggr

Comparing a disaggregation with the high-frequency input

Description

The function `in_disaggr` takes a [twoStepsBenchmark](#) or a [threeRuleSmooth](#) object as an input. It produces a comparison between the benchmarked time-serie and the high-frequency input.

Usage

```
in_disaggr(object, type = "changes")
```

Arguments

object	an object of class "twoStepsBenchmark" or "threeRuleSmooth".
type	"levels","levels-rebased", "changes" or "contributions". This defines the type of output.

Details

The functions `plot` and `autoplot` can be used on this object to produce graphics.

Value

a named matrix time-serie of two columns, one for the response and the other for the input. A `tscomparison` class is added to the object.

See Also

[in_sample](#) [in_revisions](#) [in_scatter](#) [plot.tscomparison](#)

Examples

```
benchmark <- twoStepsBenchmark(turnover,construction,include.rho = TRUE)
plot(in_disaggr(benchmark))
```

in_revisions	<i>Comparing two disaggregations together</i>
--------------	---

Description

The function `in_revisions` takes two inputs, [twoStepsBenchmark](#) or a [threeRuleSmooth](#), and produces a comparison between those.

Usage

```
in_revisions(object, object_old, type = "changes")
```

Arguments

<code>object</code>	an object of class "twoStepsBenchmark" or "threeRuleSmooth".
<code>object_old</code>	an object of class "twoStepsBenchmark" or "threeRuleSmooth".
<code>type</code>	"levels", "levels-rebased", "changes" or "contributions". This defines the type of output.

Details

The functions `plot` and `autoplot` can be used on this object to produce graphics.

Value

a named matrix time-series of two columns, one for the response and the other for the predicted value. A `tscomparison` class is added to the object.

See Also

[in_sample](#) [in_disaggr](#) [in_scatter](#) [plot.tscomparison](#)

Examples

```
benchmark <- twoStepsBenchmark(turnover, construction, include.rho = TRUE)
benchmark2 <- twoStepsBenchmark(turnover, construction, include.differentiation = TRUE)
plot(in_revisions(benchmark, benchmark2))
```

`in_sample`*Producing the in sample predictions of a prais-lm regression*

Description

The function `in_sample` returns in-sample predictions from a [praislm](#) or a [twoStepsBenchmark](#) object.

Usage

```
in_sample(object, type = "changes")
```

Arguments

`object` an object of class "praislm" or "twoStepsBenchmark".
`type` "changes" or "levels". The results are either returned in changes or in levels.

Details

The functions `plot` and `autoplot` can be used on this object to produce graphics.

The predicted values are different from the fitted values :

- they are eventually reintegrated.
- they contain the autocorrelated part of the residuals.

Besides, changes are relative to the latest benchmark value, not the latest predicted value.

Value

a named matrix time-serie of two columns, one for the response and the other for the predicted value. A "tscomparison" class is added to the object.

See Also

[in_disagr](#) [in_revisions](#) [in_scatter](#) [plot.tscomparison](#)

Examples

```
benchmark <- twoStepsBenchmark(turnover,construction,include.rho = TRUE)  
plot(in_sample(benchmark))
```

in_scatter	<i>Comparing the inputs of a praislm regression</i>
------------	---

Description

The function `in_scatter` returns low-frequency comparisons of the inputs from a [praislm](#), a [twoStepsBenchmark](#) or [threeRuleSmooth](#).

Usage

```
in_scatter(object)
```

Arguments

`object` an object of class "praislm", "twoStepsBenchmark" or "threeRuleSmooth".

Details

The functions `plot` and `autoplot` can be used on this object to produce graphics.

Value

a named matrix time-serie of two columns, one for the low-frequency serie and the other for the high-frequency-serie (eventually differenced if `include.differentiation` is TRUE). A `tscomparison` class is added to the object.

See Also

[in_sample](#) [in_disaggr](#) [in_revisions](#) [plot.tscomparison](#)

Examples

```
benchmark <- twoStepsBenchmark(turnover, construction, include.rho = TRUE)
plot(in_scatter(benchmark))
```

<code>plot.twoStepsBenchmark</code>	<i>Plotting disaggR objects</i>
-------------------------------------	---------------------------------

Description

Plot methods for objects of class "tscomparison", [threeRuleSmooth](#) and [twoStepsBenchmark](#). :

- `plot` draws a plot with base graphics
- `autoplot` produces a ggplot object

Objects of class `tscomparison` can be produced with the functions [in_sample](#), [in_scatter](#), [in_revisions](#), [in_disaggr](#).

Usage

```
## S3 method for class 'twoStepsBenchmark'
plot(
  x,
  xlab = NULL,
  ylab = NULL,
  start = NULL,
  end = NULL,
  col = default_col_pal(x),
  lty = default_lty_pal(x),
  show.legend = TRUE,
  main = NULL,
  mar = default_margins(main, xlab, ylab),
  ...
)

## S3 method for class 'threeRuleSmooth'
plot(
  x,
  xlab = NULL,
  ylab = NULL,
  start = NULL,
  end = NULL,
  col = default_col_pal(x),
  lty = default_lty_pal(x),
  show.legend = TRUE,
  main = NULL,
  mar = default_margins(main, xlab, ylab),
  ...
)

## S3 method for class 'tscomparison'
plot(
  x,
  xlab = NULL,
  ylab = NULL,
  start = NULL,
  end = NULL,
  col = default_col_pal(x),
  lty = default_lty_pal(x),
  show.legend = TRUE,
  main = NULL,
  mar = default_margins(main, xlab, ylab),
  ...
)

## S3 method for class 'twoStepsBenchmark'
autoplot(
```



```
    object,
    xlab = NULL,
    ylab = NULL,
    start = NULL,
    end = NULL,
    col = default_col_pal(object),
    lty = default_lty_pal(object),
    show.legend = TRUE,
    main = NULL,
    mar = NULL,
    theme = default_theme_ggplot(object, start, end, show.legend, xlab, ylab, mar),
    ...
)

## S3 method for class 'threeRuleSmooth'
autoplot(
  object,
  xlab = NULL,
  ylab = NULL,
  start = NULL,
  end = NULL,
  col = default_col_pal(object),
  lty = default_lty_pal(object),
  show.legend = TRUE,
  main = NULL,
  mar = NULL,
  theme = default_theme_ggplot(object, start, end, show.legend, xlab, ylab, mar),
  ...
)

## S3 method for class 'tscomparison'
autoplot(
  object,
  xlab = NULL,
  ylab = NULL,
  start = NULL,
  end = NULL,
  col = default_col_pal(object),
  lty = default_lty_pal(object),
  show.legend = TRUE,
  main = NULL,
  mar = NULL,
  theme = default_theme_ggplot(object, start, end, show.legend, xlab, ylab, mar),
  ...
)
```

Arguments

x (for the plot method) a tscomparison, a twoStepsBenchmark or a threeRuleSmooth.

xlab	the title for the x axis
ylab	the title for the y axis
start	a numeric of length 1 or 2. The start of the plot.
end	a numeric of length 1 or 2. The end of the plot.
col	the color scale applied on the plot. Could be a vector of colors, or a function from n to a color vector of size n.
lty	the linetype scales applied on the plot. Could be a vector of linetypes, or a function from n to a linetypes vector of size n.
show.legend	TRUE or FALSE. Should an automatic legend be added to the plot.
main	a character of length 1, the title of the plot
mar	a numeric of length 4, the margins of the plot specified in the form <code>c(bottom, left, top, right)</code> .
...	other arguments passed either to <code>ggplot</code> or <code>plot</code>
object	(for the <code>autoplot</code> method) a <code>tcomparison</code> , a <code>twoStepsBenchmark</code> or a <code>threeRuleSmooth</code> .
theme	a <code>ggplot</code> theme object to replace the default one (only for <code>autoplot</code> methods)

Value

NULL for the plot methods, the `ggplot` object for the `autoplot` methods

Examples

```
benchmark <- twoStepsBenchmark(turnover, construction, include.rho = TRUE)
plot(benchmark)
plot(in_sample(benchmark))
if(require("ggplot2")) {
  autoplot(in_disaggr(benchmark, type="changes"),
           start=c(2015, 1),
           end=c(2020, 12))
}
plot(in_scatter(benchmark), xlab="title x", ylab="title y")
```

rePort

Producing a report

Description

This function takes an output of the [reView shiny](#) application and produces an html report with the same outputs than in shiny.

Usage

```
rePort(
  object,
  output_file = NULL,
  launch.browser = if (is.null(output_file)) TRUE else FALSE,
  ...
)
```

Arguments

object	a twoStepsBenchmark with an univariate hfserie, a reViewOutput, or a character of length 1 with the path of their RDS file. If a reViewOutput is chosen, the former new benchmark is taken as the old one.
output_file	The file in which the html should be saved. If NULL the file is temporary, and opened in a tab of the default browser.
launch.browser	TRUE or FALSE. If TRUE, the output is opened in the browser. Defaults to TRUE if output_file is NULL.
...	other arguments passed to rmarkdown::render

Details

It can also directly take a [twoStepsBenchmark](#) as an input.

See Also

reView

reUseBenchmark	<i>Using an estimated benchmark model on another time-serie</i>
----------------	---

Description

This function reapplies the coefficients and parameters of a benchmark on new time-serie.

Usage

```
reUseBenchmark(hfserie,benchmark,reeval.smoothed.part=FALSE)
```

Arguments

hfserie	the bended time-serie. If it is a matrix time-serie, it has to have the same column names than the hfserie used for the benchmark.
benchmark	a twoStepsBenchmark object, from which the parameters and coefficients are taken.
reeval.smoothed.part	a boolean of length 1. If TRUE, the smoothed part is reevaluated, hence the aggregated benchmarked serie is equal to the low-frequency serie.

Details

reUseBenchmark is primarily meant to be used on a serie that is derived from the previous one, after some modifications that would bias the estimation otherwise. Working-day adjustment is a good example. Hence, by default, the smoothed part of the first model isn't reevaluated ; the aggregated benchmarked serie isn't equal to the low-frequency serie.

Value

reUseBenchmark returns an object of class [twoStepsBenchmark](#).

Examples

```
benchmark <- twoStepsBenchmark(turnover, construction)
turnover_modif <- turnover
turnover_modif[2] <- turnover[2]+2
benchmark2 <- reUseBenchmark(turnover_modif, benchmark)
```

reView

A shiny app to reView and modify twoStepsBenchmarks

Description

reView allows the user to easily access diverse outputs in order to review a benchmark object, made with [twoStepsBenchmark](#).

The hfserie_name and lfserie_name define :

Usage

```
reView(object, hfserie_name = NULL, lfserie_name = NULL, compare = TRUE)
```

Arguments

object	a twoStepsBenchmark with an univariate hfserie, a reViewOutput, or a character of length 1 with the path of their RDS file. If a reViewOutput is chosen, the former new benchmark is taken as the old one.
hfserie_name	a character of length 1. The name of the hfserie.
lfserie_name	a character of length 1. The name of the lfserie.
compare	a boolean of length 1, that tells if the outputs of the old benchmark should be displayed.

Details

- the default file name of the RDS file
- the names of the series in the output call element

By default, these are set as defined in their call element.

The app is made of **shiny** modules in order to make it easy to integrate it into a wider application. In the module part, every input are defined as reactive variables.

Value

a list, of class reViewOutput, containing the new benchmark, the old one, the names of the series and the boolean compare. This object can also be saved in RDS format through the app. The reViewOutput object can be displayed as a html report with the same informations than in shiny, with the [rePort](#) method.

See Also[rePort](#)**Examples**

```
## Not run:
reView(twoStepsBenchmark(turnover, construction))

## End(Not run)
```

threeRuleSmooth	<i>Bends a time-series with a lower frequency one by smoothing their rate</i>
-----------------	---

Description

threeRuleSmooth bends a time-series with a time-series of a lower frequency. The procedure involved is a proportional Denton benchmark.

Therefore, the resulting time-series is the product of the high-frequency input with a smoothed rate. This latter is extrapolated through an arithmetic sequence.

The resulting time-series is equal to the low-frequency serie after aggregation within the benchmark window.

Usage

```
threeRuleSmooth(
  hfserie,
  lfserie,
  start.benchmark = NULL,
  end.benchmark = NULL,
  start.domain = NULL,
  end.domain = NULL,
  start.delta.rate = NULL,
  end.delta.rate = NULL,
  set.delta.rate = NULL,
  ...
)
```

Arguments

hfserie	the bended time-series. It can be a matrix time-series.
lfserie	a time-series whose frequency divides the frequency of hfserie.
start.benchmark	an optional start for lfserie to bend hfserie. Should be a numeric of length 1 or 2, like a window for lfserie. If NULL, the start is defined by lfserie's window.

<code>end.benchmark</code>	an optional end for <code>lfserie</code> to bend <code>hfserie</code> . Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the start is defined by <code>lfserie</code> 's window.
<code>start.domain</code>	an optional start of the output high-frequency serie. It also defines the smoothing window : The low-frequency residuals will be extrapolated until they contain the smallest low-frequency window that is around the high-frequency domain window. Should be a numeric of length 1 or 2, like a window for <code>hfserie</code> . If NULL, the start is defined by <code>hfserie</code> 's window.
<code>end.domain</code>	an optional end of the output high-frequency serie. It also defines the smoothing window : The low-frequency residuals will be extrapolated until they contain the smallest low-frequency window that is around the high-frequency domain window.
<code>start.delta.rate</code>	an optional start for the mean of the rate difference. It is required as a common difference for the arithmetical extrapolation of the rate. Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the start is defined by <code>lfserie</code> 's window.
<code>end.delta.rate</code>	an optional end for the mean of the rate difference. It is required as a common difference for the arithmetical extrapolation of the rate. Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the end is defined by <code>lfserie</code> 's window.
<code>set.delta.rate</code>	an optional double, that allows the user to set the delta mean instead of using a mean.
<code>...</code>	if the dots contain a <code>cl</code> item, its value overwrites the value of the returned call. This feature allows to build wrappers.

Details

In order to smooth the rate, `threeRuleSmooth` calls `bfiSmooth` and uses a modified and extrapolated version of `hfserie` as weights :

- only the full cycles are kept
- the first and last full cycles are replicated respectively backwards and forwards to fill the domain window.

Value

`threeRuleSmooth` returns an object of class `"threeRuleSmooth"`.

The functions `plot` and `autoplot` (the generic from **ggplot2**) produce graphics of the benchmarked serie and the bending serie. The functions `in_disaggr`, `in_revisions`, `in_scatter` produce various comparisons on which `plot` and `autoplot` can also be used.

The generic accessor functions `as.ts`, `model.list`, `smoothed.rate` extract various useful features of the returned value.

An object of class `"threeRuleSmooth"` is a list containing the following components :

`benchmarked.serie`
a time-serie, that is the result of the benchmark.

lfrate	a time-serie, that is the low-frequency rate of the threeRuleSmooth.
smoothed.rate	the smoothed rate of the threeRuleSmooth.
hfserie.as.weights	the modified and extrapolated hfserie (see details).
delta.rate	the low-frequency delta of the rate, used to extrapolate the low-frequency rate time-serie. It is estimated as the mean value in the specified window.
model.list	a list containing all the arguments submitted to the function.
call	the matched call.

Examples

```
## How to use threeRuleSmooth

smooth <- threeRuleSmooth(hfserie = turnover,
                          lfserie = construction)

as.ts(smooth)
coef(smooth)
summary(smooth)
library(ggplot2)
autoplot(in_disaggr(smooth))
```

twoStepsBenchmark *Regress and bends a time-serie with a lower frequency one*

Description

twoStepsBenchmark bends a time-serie with a time-serie of a lower frequency. The procedure involved is a Prais-Winsten regression, then an additive Denton benchmark.

Therefore, the resulting time-serie is the sum of a regression fit and of a smoothed part. The smoothed part minimizes the sum of squares of its differences.

The resulting time-serie is equal to the low-frequency serie after aggregation within the benchmark window.

Usage

```
twoStepsBenchmark(hfserie, lfserie, include.differentiation=FALSE, include.rho=FALSE,
                  set.coeff=NULL, set.const=NULL,
                  start.coeff.calc=NULL, end.coeff.calc=NULL,
                  start.benchmark=NULL, end.benchmark=NULL,
                  start.domain=NULL, end.domain=NULL, outliers=NULL,
                  ...)
```

```
annualBenchmark(hfserie, lfserie,
```

```

include.differentiation=FALSE,include.rho=FALSE,
set.coeff=NULL,set.const=NULL,
start.coeff.calc=start(lfserie)[1L],
end.coeff.calc=end(lfserie)[1L],
start.benchmark=start(lfserie)[1L],
end.benchmark=end.coeff.calc[1L]+1L,
start.domain=start(hfserie),
end.domain=c(end.benchmark[1L]+2L,frequency(hfserie)),
outliers=NULL)

```

Arguments

<code>hfserie</code>	the bended time-serie. It can be a matrix time-serie.
<code>lfserie</code>	a time-serie whose frequency divides the frequency of <code>hfserie</code> .
<code>include.differentiation</code>	a boolean of length 1. If TRUE, <code>lfserie</code> and <code>hfserie</code> are differenced before the estimation of the regression.
<code>include.rho</code>	a boolean of length 1. If TRUE, the regression includes an autocorrelation parameter for the residuals. The applied procedure is a Prais-Winsten estimation.
<code>set.coeff</code>	an optional numeric, that allows the user to set the regression coefficients instead of evaluating them. If <code>hfserie</code> is not a matrix, <code>set.coeff</code> can be an unnamed numeric of length 1. Otherwise, <code>set.coeff</code> has to be a named numeric, which will set the corresponding coefficients instead of evaluating them. Each column name of <code>hfserie</code> and each outlier set with the <code>outlier</code> arg initialize a coefficient with the same name, that can be set through <code>set.coeff</code> . The default name for a non-matrix time-serie is then "hfserie", By example, a LS2003 and the time-serie can be set using <code>set.coeff=c(hfserie=3,LS2003=1)</code> .
<code>set.const</code>	an optional numeric of length 1, that sets the regression constant. The constant is actually an automatically added column to <code>hfserie</code> . Using <code>set.constant=3</code> is equivalent to using <code>set.coeff=c(constant=3)</code> .
<code>start.coeff.calc</code>	an optional start for the estimation of the coefficients of the regression. Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the start is defined by <code>lfserie</code> 's window.
<code>end.coeff.calc</code>	an optional end for the estimation of the coefficients of the regression. Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the end is defined by <code>lfserie</code> 's window.
<code>start.benchmark</code>	an optional start for <code>lfserie</code> to bend <code>hfserie</code> . Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the start is defined by <code>lfserie</code> 's window.
<code>end.benchmark</code>	an optional end for <code>lfserie</code> to bend <code>hfserie</code> . Should be a numeric of length 1 or 2, like a window for <code>lfserie</code> . If NULL, the start is defined by <code>lfserie</code> 's window.
<code>start.domain</code>	an optional for the output high-frequency serie. It also defines the smoothing window : The low-frequency residuals will be extrapolated until they contain

	the smallest low-frequency window that is around the high-frequency domain window. Should be a numeric of length 1 or 2, like a window for hfserie. If NULL, the start is defined by hfserie's window.
end.domain	an optional end for the output high-frequency serie. It also defines the smoothing window : The low-frequency residuals will be extrapolated until they contain the smallest low-frequency window that is around the high-frequency domain window. Should be a numeric of length 1 or 2, like a window for hfserie. If NULL, the start is defined by hfserie's window.
outliers	an optional named list of numeric vectors, whose pattern is like <code>list(A02008T2=c(0,0,3,2),LS2002=c(</code> where : <ul style="list-style-type: none"> • "AO" stands for additive outlier or "LS" for level shift • The integer that follows stands for the outlier starting year • an optional integer, preceded by the letter T, stands for the low-frequency cycle of the outlier start. • The numeric vector values stands for the disaggregated value of the outlier and must be a multiple of hf / lf <p>The outliers coefficients are evaluated though the regression process, like any coefficient. Therefore, if any outlier is outside of the coefficient calculation window, it should be fixed using <code>set.coeff</code>.</p>
...	if the dots contain a <code>cl</code> item, its value overwrites the value of the returned call. This feature allows to build wrappers.

Details

`annualBenchmark` is a wrapper of the main function, that applies more specifically to annual series, and changes the default window parameters to the ones that are commonly used by quarterly national accounts.

Value

`twoStepsBenchmark` returns an object of class "twoStepsBenchmark".

The function summary can be used to obtain and print a summary of the regression used by the benchmark. The functions `plot` and `autoplot` (the generic from **ggplot2**) produce graphics of the benchmarked serie and the bending serie. The functions `in_disaggr`, `in_revisions`, `in_scatter` produce comparisons on which `plot` and `autoplot` can also be used.

The generic accessor functions `as.ts`, `prais`, `coefficients`, `residuals`, `fitted.values`, `model.list`, `se`, `rho` extract various useful features of the returned value.

An object of class "twoStepsBenchmark" is a list containing the following components :

<code>benchmark serie</code>	a time-serie, that is the result of the benchmark. It is equal to <code>fitted.values + smoothed.part</code> .
<code>fitted.values</code>	a time-serie, that is the high-frequency serie as it is after having applied the regression coefficients. Compared to the fitted values of the regression, which can be retrieved inside the regression component, it has a high-frequency time-serie and can eventually be integrated if <code>include.differentiation</code> is TRUE.

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