

# Package ‘seasonal’

June 6, 2020

**Type** Package

**Title** R Interface to X-13-ARIMA-SEATS

**Version** 1.7.1

**Date** 2020-06-06

**Description** Easy-to-use interface to X-13-ARIMA-SEATS, the seasonal adjustment software by the US Census Bureau. It offers full access to almost all options and outputs of X-13, including X-11 and SEATS, automatic ARIMA model search, outlier detection and support for user defined holiday variables, such as Chinese New Year or Indian Diwali. A graphical user interface can be used through the 'seasonalview' package. Uses the X-13-binaries from the 'x13binary' package.

**Depends** R (>= 2.15)

**Imports** x13binary

**Suggests** seasonalview (>= 0.1.3)

**License** GPL-3

**URL** <http://www.seasonal.website>

**BugReports** <https://github.com/christophsax/seasonal>

**LazyData** true

**RoxygenNote** 7.1.0

**Encoding** UTF-8

**NeedsCompilation** no

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**Repository** CRAN

**Date/Publication** 2020-06-06 10:10:02 UTC

**R topics documented:**

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|                  |   |
|------------------|---|
| seasonal-package | <i>seasonal: R interface to X-13ARIMA-SEATS</i> |
|------------------|---|

---

**Description**

**seasonal** is an asy-to-use interface to X-13-ARIMA-SEATS, the seasonal adjustment software by the US Census Bureau. It offers full access to almost all options and outputs of X-13, including X-11 and SEATS, automatic ARIMA model search, outlier detection and support for user defined holiday variables, such as Chinese New Year or Indian Diwali. A graphical user interface can be used through the **seasonalview** package. Uses the X-13-binaries from the **x13binary** package.

The best way to start is to have a look at the vignette:

```
vignette("seas")
```

## Installation

Seasonal depends on the **x13binary** package, which downloads and installs the X-13 binaries. To install both packages, simply type to the R console:

```
install.packages("seasonal")
```

A startup message is given if the path to X-13 is specified manually. To suppress the message, use [suppressPackageStartupMessages](#).

## Setting the X-13 path manually

Sometimes, you either cannot or don't want to rely on the binaries provided by **x13binary**:

- because you are on an unsupported system, like Solaris. If you manage to build X-13 on such a system, please let the developers of **x13binary** know.
- because you cannot run executable files in your R library folders, due to corporate IT policy.
- because you are using your own Fortran compilation of X-13ARIMA-SEATS.

Setting the path manually can be done as in previous versions of seasonal. In order to tell seasonal where to find the binary executables of X-13ARIMA- SEATS, the specific environmental variable X13\_PATH needs to be set. This may be done during your active session in R:

```
Sys.setenv(X13_PATH = "YOUR_X13_DIRECTORY")
```

Exchange YOUR\_X13\_DIRECTORY with the path to your installation of X-13ARIMA- SEATS. You can always check your installation with:

```
checkX13()
```

If it works, you may want to set the environmental variable permanently, by adding the Sys.setenv line to one of your .Rprofile files. The easiest is to use the one located in your home directory, which can be written directly from R:

```
write('Sys.setenv(X13_PATH = "YOUR_X13_DIRECTORY")', file = "~/.Rprofile", append = TRUE)
```

If the file does not exist (by default), it will be created. Make sure that you get the quotes right: double quotes around your directory, single quotes around the whole Sys.setenv line, such that R understands your string. Check first that the Sys.setenv line works correctly; once it is written you may have to edit .Rprofile manually. (Or add a second, overwriting line to it.) For other ways to set an environmental variable permanently in R, see [Startup](#).

## Author(s)

Christoph Sax <christoph.sax@gmail.com>

## References

Sax C, Eddelbuettel D (2018). "Seasonal Adjustment by X-13ARIMA-SEATS in R." *Journal of Statistical Software*, 87(11), 1-17. doi: 10.18637/jss.v087.i11 (<http://doi.org/10.18637/jss.v087.i11>).

## See Also

[seas](#) for the core function and more information on package usage.

**Description**

The arimamodel functions is defunct now. Use the more universal [udg](#) function.

The inspect functions is defunct now. Use the extended [view](#) function instead.

**Usage**

```
arimamodel(x)
```

```
inspect(x, fun = NULL, check.version = TRUE, quiet = TRUE, ...)
```

**Arguments**

|               |  |
|---------------|--|
| x             | an object of class "seas".   |
| fun           | a function or a list of functions (see details)  |
| check.version | logical, should the version of shiny be checked  |
| quiet         | logical, if TRUE (default), error messages from calls in inspect are not shown in the console                                    |
| ...           | further arguments, passed on to <a href="#">runApp</a> . (The launch.browser argument of version 0.8 can be still used that way) |

**See Also**

[udg](#), for universal access to X-13 statistics

[view](#), for an extended graphical user interface.

**Examples**

```
## Not run:  
m <- seas(AirPassengers)  
udg(x, "x13mdl")
```

```
## End(Not run)  
## Not run:  
m <- seas(AirPassengers)  
view(m)
```

```
## End(Not run)
```

---

as.data.frame.seas      *Coerce Output to data.frame*

---

### Description

These methods coerce the output to a `data.frame`. This is useful for further processing. (This is a second attempt to do that; the first experimental attempt in version 1.4 used an argument `data.frame` in the call to the functions, and is now obsolete. The present approach seems cleaner and is likely to stay, but still consider it as **experimental**.)

### Usage

```
## S3 method for class 'seas'  
as.data.frame(x, ...)  
  
## S3 method for class 'summary.seas'  
as.data.frame(x, ...)
```

### Arguments

|                  |   |
|------------------|---|
| <code>x</code>   | an object of class "seas" or "summary.seas", usually, the result of a call to the functions with the same name. |
| <code>...</code> | unused.   |

### Details

The `data.frames` produced by these functions follow the naming conventions from the 'broom' package, but do not depend on it otherwise.

### Value

a `data.frame` without row names.

### Examples

```
## Not run:  
m <- seas(AirPassengers, x11 = "")  
  
# a data.frame containing data  
as.data.frame(m)  
  
# a data.frame containing the summary information on the coefficients  
as.data.frame(summary(m))  
  
## End(Not run)
```

---

 checkX13

*Check Installation of X-13ARIMA-SEATS*


---

### Description

Check the installation of the binary executables of X-13ARIMA-SEATS. See [seasonal](#) for details on how to set X13\_PATH manually if you intend to use your own binaries.

### Usage

```
checkX13(fail = FALSE, fullcheck = TRUE, htmlcheck = TRUE)
```

### Arguments

|           |   |
|-----------|---|
| fail      | logical, whether an error should interrupt the process. If FALSE, a message is returned.  |
| fullcheck | logical, whether a full test should be performed. Runs <code>Testairline.spc</code> (which is shipped with X-13ARIMA-SEATS) to test the working of the binaries. Returns a message. |
| htmlcheck | logical, whether the presence of the the HTML version of X-13 should be checked.  |

### Examples

```
## Not run:
old.path <- Sys.getenv("X13_PATH")
Sys.setenv(X13_PATH = "") # its broken now
checkX13()

Sys.setenv(X13_PATH = old.path) # fix it (provided it worked in the first place)
checkX13()

## End(Not run)
```

---

 cpi

*Consumer Price Index of Switzerland*


---

### Description

Monthly consumer price index of Switzerland. Base year is 1993.

### Format

Time series of class "ts".

**Source**

Federal Statistical Office, Switzerland

**Examples**

```
data(seasonal)
cpi
```

---

easter

*Dates of Chinese New Year, Indian Diwali and Easter*

---

**Description**

Dates of Chinese New Year, Indian Diwali and Easter, suitable for the use in [genhol](#).

**Format**

Objects of class "Date".

**Source**

[https://www.census.gov/srd/www/genhol/genhol\\_downloads.html](https://www.census.gov/srd/www/genhol/genhol_downloads.html)

<http://www.chinesenewyears.info/chinese-new-year-calendar.php>

Ministry of Statistics and Programme Implementation, with help from Pinaki Mukherjee

**Examples**

```
data(holiday)
cny
diwali
easter
```

---

exp

*Exports and Imports of China*

---

**Description**

Monthly exports and imports of China (July 1983 to December 2013).

**Format**

Each time series is an object of class "ts".

**Details**

In 100 mio. U.S. Dollar.

**Source**

China Customs

**Examples**

```
data(seasonal)
imp
exp
```

---

final

*Time Series of a Seasonal Adjustment Model*

---

**Description**

Functions to extract the main time series from a "seas" object. For universal import of X-13ARIMA-SEATS tables, use the [series](#) function.

**Usage**

```
final(object)

original(object)

trend(object)

irregular(object)

## S3 method for class 'seas'
residuals(object, ...)
```

**Arguments**

|        |   |
|--------|---|
| object | an object of class "seas".                    |
| ...    | not used. For compatibility with the generic. |

**Details**

These functions support R default NA handling. If `na.action = na.exclude` is specified in the call to `seas`, the time series will also contain NAs.

**Value**

returns a "ts" object, depending on the function.



## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[seas](#) for the main function of seasonal.

[series](#), for universal X-13 output extraction.

## Examples

```
## Not run:

m <- seas(AirPassengers)

final(m)
original(m)
irregular(m)
trend(m)

# NA handling
AirPassengersNA <- window(AirPassengers, end = 1962, extend = TRUE)
final(seas(AirPassengersNA, na.action = na.omit)) # no NA in final series
final(seas(AirPassengersNA, na.action = na.exclude)) # NA in final series
final(seas(AirPassengersNA, na.action = na.x13)) # NA filled by x13
# final(seas(AirPassengersNA, na.action = na.fail)) # fails

## End(Not run)
```

---

fivebestmdl

*Five Best ARIMA Models*

---

## Description

Returns the five best models as chosen by the BIC criterion. It needs the `automdl` spec to be activated (default). If it is not activated, the function tries to re-evaluate the model with the `automdl` spec activated.

## Usage

```
fivebestmdl(x)
```

## Arguments

x                    object of class "seas"

## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[seas](#) for the main function.

[series](#), for universal X-13 output extraction.

[plot.seas](#), for diagnostical plots.

[out](#), for accessing the full output of X-13ARIMA-SEATS.

## Examples

```
## Not run:

m <- seas(AirPassengers)
fivebestmdl(m)

## End(Not run)
```

---

genhol

*Generate Holiday Regression Variables*

---

## Description

A replacement for the genhol software by the U.S. Census Bureau, a utility that uses the same procedure as X-12-ARIMA to create regressors for the U. S. holidays of Easter, Labor Day, and Thanksgiving. **This is a replacement written in R, the U.S. Census Bureau software is not needed.**

## Usage

```
genhol(x, start = 0, end = 0, frequency = 12, center = "none")
```

## Arguments

|           |   |
|-----------|---|
| x         | a vector of class "Date", containing the occurrences of the holiday. It can be generated with <a href="#">as.Date</a> . |
| start     | integer, shifts the start point of the holiday. Use negative values if start is before the specified date.              |
| end       | integer, shifts end point of the holiday. Use negative values if end is before the specified date.                      |
| frequency | integer, frequency of the resulting series  |

center character string. Either "calendar", "mean" or "none" (default). Centering avoids a bias in the resultign series. Use "calendar" for Easter or Chinese New Year, "mean" for Ramadan. See references: Notes on centering holiday.

### Details

The resulting time series can be used as a user defined variable in [seas](#). Usually, you want the holiday effect to be removed from the final series, so you need to specify `regression.usertype = "holiday"`. (The default is to include user defined variables in the final series.)

### Value

an object of class "ts" that can be used as a user defined variable in [seas](#).

### References

United States Census Bureau, Notes on centering holiday regressors: [https://www.census.gov/srd/www/genhol/genhol\\_center.html](https://www.census.gov/srd/www/genhol/genhol_center.html)

### See Also

[seas](#) for the main function of seasonal.

### Examples

```
## Not run:

data(holiday) # dates of Chinese New Year, Indian Diwali and Easter

### use of genhol

# 10 day before Easter day to one day after, quarterly data:
genhol(easter, start = -10, end = 1, frequency = 4)
genhol(easter, frequency = 2) # easter is allways in the first half-year

# centering for overall mean or monthly calendar means
genhol(easter, center = "mean")
genhol(easter, center = "calendar")

### replicating X-13's built-in Easter adjustment

# built-in
m1 <- seas(x = AirPassengers,
  regression.variables = c("td1coef", "easter[1]", "ao1951.May"),
  arima.model = "(0 1 1)(0 1 1)", regression.aicctest = NULL,
  outlier = NULL, transform.function = "log", x11 = "")
summary(m1)

# user defined variable
ea1 <- genhol(easter, start = -1, end = -1, center = "calendar")
```

```

# regression.usertype = "holiday" ensures that the effect is removed from
# the final series.
m2 <- seas(x = AirPassengers,
           regression.variables = c("td1coef", "ao1951.May"),
           xreg = ea1, regression.usertype = "holiday",
           arima.model = "(0 1 1)(0 1 1)", regression.aictest = NULL,
           outlier = NULL, transform.function = "log", x11 = "")
summary(m2)

all.equal(final(m2), final(m1), tolerance = 1e-06)

# with genhol, its possible to do slightly better, by adjusting the length
# of easter from Friday to Monday:

ea2 <- genhol(easter, start = -2, end = +1, center = "calendar")
m3 <- seas(x = AirPassengers,
           regression.variables = c("td1coef", "ao1951.May"),
           xreg = ea2, regression.usertype = "holiday",
           arima.model = "(0 1 1)(0 1 1)", regression.aictest = NULL,
           outlier = NULL, transform.function = "log", x11 = "")
summary(m3)

### Chinese New Year

data(seasonal)
data(holiday) # dates of Chinese New Year, Indian Diwali and Easter

# de facto holiday length: http://en.wikipedia.org/wiki/Chinese\_New\_Year
cny.ts <- genhol(cny, start = 0, end = 6, center = "calendar")

m1 <- seas(x = imp, xreg = cny.ts, regression.usertype = "holiday", x11 = "",
           regression.variables = c("td1coef", "ls1985.Jan", "ls2008.Nov"),
           arima.model = "(0 1 2)(0 1 1)", regression.aictest = NULL,
           outlier = NULL, transform.function = "log")
summary(m1)

# compare to identical no-CNY model
m2 <- seas(x = imp, x11 = "",
           regression.variables = c("td1coef", "ls1985.Jan", "ls2008.Nov"),
           arima.model = "(0 1 2)(0 1 1)", regression.aictest = NULL,
           outlier = NULL, transform.function = "log")
summary(m2)

ts.plot(final(m1), final(m2), col = c("red", "black"))

# modeling complex holiday effects in Chinese imports
# - positive pre-CNY effect
# - negative post-CNY effect
pre_cny <- genhol(cny, start = -6, end = -1, frequency = 12, center = "calendar")
post_cny <- genhol(cny, start = 0, end = 6, frequency = 12, center = "calendar")
m3 <- seas(x = imp, x11 = "",

```

```

        xreg = cbind(pre_cny, post_cny), regression.usertype = "holiday",
        x11 = list())
summary(m3)

### Indian Diwali (thanks to Pinaki Mukherjee)

# adjusting Indian industrial production
m4 <- seas(iip,
x11 = "",
xreg = genhol(diwali, start = 0, end = 0, center = "calendar"),
regression.usertype = "holiday"
)
summary(m4)

# without specification of 'regression.usertype', Diwali effects are added
# back to the final series
m5 <- seas(iip,
x11 = "",
xreg = genhol(diwali, start = 0, end = 0, center = "calendar")
)

ts.plot(final(m4), final(m5), col = c("red", "black"))

# plot the Diwali factor in Indian industrial production
plot(series(m4, "regression.holiday"))

### Using genhol to replicate the regARIMA estimation in R

# easter regressor
ea <- genhol(easter, start = -1, end = -1, center = "calendar")
ea <- window(ea, start = start(AirPassengers), end = end(AirPassengers))

# estimating ARIMA model in R base
arima(log(AirPassengers), order = c(0,1,1), seasonal = c(0,1,1), xreg = ea)

summary(seas(AirPassengers, regression.variables = c("easter[1]"),
regression.aictest = NULL))

# Note that R defines the ARIMA model with negative signs before the MA term,
# X-13 with a positive sign.

## End(Not run)

```

**Description**

Select or deselect outliers by point and click. To quit and return the call, press ESC. Click several times to loop through different outlier types.

**Usage**

```
## S3 method for class 'seas'
identify(x, type = c("ao", "tc", "ls"), ...)
```

**Arguments**

|      |  |
|------|--|
| x    | an object of class "seas".                           |
| type | character vector, types of outlier to loop through.  |
| ...  | unused, for compatibility with the generic function. |

**Value**

an object of class "seas", containing the static call of the selected model.

**Examples**

```
## Not run:
m <- seas(AirPassengers)
identify(m)

## End(Not run)
```

---

iip

---

*Industrial Production of India*


---

**Description**

Industrial Production of India (IIP).

**Format**

Time series of class "ts".

**Details**

Index value. IIP is used for measuring the performance overall industrial sector of the Indian economy. IIP is compiled by using data from 16 source agencies.

**Source**

Central Statistics Office of the Ministry of Statistics and Programme Implementation, with help from Pinaki Mukherjee

**Examples**

```
data(seasonal)
iip
```

---

|            |                               |
|------------|-------------------------------|
| import.spc | <i>Import X-13 .spc Files</i> |
|------------|-------------------------------|

---

**Description**

Utility function to import .spc files from X-13. It generates a list of calls to seas (and import.ts) that can be run in R. Evaluating these calls should perform the same X-13 procedure as the original .spc file. The print method displays the calls in a way that they can be copy-pasted into an R script.

**Usage**

```
import.spc(file, text = NULL)

## S3 method for class 'import.spc'
print(x, ...)
```

**Arguments**

|      |   |
|------|---|
| file | character, path to the X-13 .spc file                                       |
| text | character, alternatively, the content of a .spc file as a character string. |
| x    | object of class import.spc  |
| ...  | further arguments, not used   |

**Value**

returns an object of class import.spc, which is a list with the following (optional) objects of class call:

|        |   |
|--------|---|
| x      | the call to retrieve the data for the input series                            |
| xtrans | the call to retrieve the data for the xtrans series (if required by the call) |
| xreg   | the call to retrieve the data for the xreg series (if required by the call)   |
| seas   | the call to <a href="#">seas</a>  |

**See Also**

[import.ts](#), for importing X-13 data files.  
[seas](#) for the main function of seasonal.

**Examples**

```

# importing the original X-13 example file
import.spc(text =
',
  series{
    title="International Airline Passengers Data from Box and Jenkins"
    start=1949.01
    data=(
      112 118 132 129 121 135 148 148 136 119 104 118
      115 126 141 135 125 149 170 170 158 133 114 140
      145 150 178 163 172 178 199 199 184 162 146 166
      171 180 193 181 183 218 230 242 209 191 172 194
      196 196 236 235 229 243 264 272 237 211 180 201
      204 188 235 227 234 264 302 293 259 229 203 229
      242 233 267 269 270 315 364 347 312 274 237 278
      284 277 317 313 318 374 413 405 355 306 271 306
      315 301 356 348 355 422 465 467 404 347 305 336
      340 318 362 348 363 435 491 505 404 359 310 337
      360 342 406 396 420 472 548 559 463 407 362 405
      417 391 419 461 472 535 622 606 508 461 390 432)
    span=(1952.01, )
  }
  spectrum{
    savelog=peaks
  }
  transform{
    function=auto
    savelog=autotransform
  }
  regression{
    aictest=(td easter)
    savelog=aictest
  }
  automdl{
    savelog=automodel
  }
  outlier{ }
  x11{}
',
)

## Not run:

### reading .spc with multiple user regression and transformation series

# running a complex seas call and save output in a temporary directory
tdir <- tempdir()
seas(x = AirPassengers, xreg = cbind(a = genhol(cny, start = 1, end = 4,
  center = "calendar"), b = genhol(cny, start = -3, end = 0,
  center = "calendar")), xtrans = cbind(sqrt(AirPassengers), AirPassengers^3),
  transform.function = "log", transform.type = "temporary",

```



```

    regression.aictest = "td", regression.usertype = "holiday", dir = tdir,
    out = TRUE)

# importing the .spc file from the temporary location
ll <- import.spc(file.path(tdir, "iofile.spc"))

# ll is list containing four calls:
# - 'll$x', 'll$xreg' and 'll$xtrans': calls to import.ts(), which read the
#   series from the X-13 data files
# - 'll$seas': a call to seas() which performs the seasonal adjustment in R
str(ll)

# to replicate the original X-13 operation, run all four calls in a series.
# You can either copy/paste and run the print() output:
ll

# or use eval() to evaluate the call(s). To evaluate the first call and
# import the x variable:
eval(ll$x)

# to run all four calls in 'll', use lapply() and eval():
ee <- lapply(ll, eval, envir = globalenv())
ee$seas # the 'seas' object, produced by the final call to seas()

## End(Not run)

```

---

import.ts

---

*Import Time Series from X-13 Data Files*


---

## Description

Utility function to read time series from X-13 data files. A call to `import.ts` is constructed and included in the output of `import.spc`.

## Usage

```

import.ts(
  file,
  format = "datevalue",
  start = NULL,
  frequency = NULL,
  name = NULL
)

```

## Arguments

|        |  |
|--------|--|
| file   | character, name of the X-13 file which the data are to be read from  |
| format | a valid X-13 file format as described in 7.15 of the X-13 manual: "datevalue", "datevaluecomma", "free", "freecomma", "x13save", "tramo" or an X-11 or Fortran format. |

|           |   |
|-----------|---|
| start     | vector of length 2, time of the first observation (only for formats "free" and "freecomma" and the Fortran formats.)  |
| frequency | the number of observations per unit of time (only for formats "free", "freecomma" and the X-11 or Fortran formats.)   |
| name      | (X-11 formats only) name of the series, to select from a file with multiple time series. Omit if you want to read all time series from an X-11 format file. |

**Value**

an object of class `ts` or `mts`

**See Also**

[import.spc](#), for importing X-13 .spc files.

[seas](#) for the main function of seasonal.

**Examples**

```
## Not run:
tdir <- tempdir()
seas(x = AirPassengers, dir = tdir)
import.ts(file.path(tdir, "data.dta"))
import.ts(file.path(tdir, "iofile.rsd"), format = "x13save")

## End(Not run)
```

---

na.x13

*Handle Missing Values by X-13*


---

**Description**

Utility function to substitute NA values by -99999. Useful as a value for the `na.action` argument in [seas](#).

**Usage**

```
na.x13(x)
```

**Arguments**

`x` an object of class "ts"

**Value**

a time series, with NA values substituted by -99999.

## Examples

```
## Not run:
#' AirPassengersNA <- AirPassengers
AirPassengersNA[20] <- NA
na.x13(AirPassengersNA)

seas(AirPassengersNA, na.action = na.x13)

## End(Not run)
```

---

out

*Display X-13ARIMA-SEATS Output*

---

## Description

The out function shows the full content of the X-13ARIMA-SEATS output in the browser. If you want to use a specific statistic in R, the [udg](#) function is preferable.

## Usage

```
out(x, browser = getOption("browser"), ...)
```

## Arguments

|         |  |
|---------|--|
| x       | an object of class "seas".   |
| browser | browser to be used, passed on to <a href="#">browseURL</a> .   |
| ...     | additional spec-arguments options sent to X-13ARIMA-SEATS during re-evaluation, passed to <a href="#">update</a> . |

## Details

To keep the size of "seas" objects small, seas does not save the output by default. Instead, out re-evaluates the model.

## Value

displays the output as a side effect.

## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>  
Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>  
Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

**See Also**

[seas](#) for the main function of seasonal.

**Examples**

```
## Not run:
m <- seas(AirPassengers)
out(m)
# customizing the output with additional elements
out(m, automdl.print = "autochoicemdl")

## End(Not run)
```

---

outlier

*Outlier Time series*

---

**Description**

Returns an object of class "ts" that contains the names of the outliers.

**Usage**

```
outlier(x, full = FALSE)
```

**Arguments**

|      |  |
|------|--|
| x    | an object of class "seas".   |
| full | logical, should the full label of the outlier be shown? If FALSE, only the type of the outlier is shown. |

**Value**

character string time series with outliers.

**Examples**

```
## Not run:
x <- seas(AirPassengers)
outlier(x)

## End(Not run)
```

---

|           |                                  |
|-----------|----------------------------------|
| plot.seas | <i>Seasonal Adjustment Plots</i> |
|-----------|----------------------------------|

---

### Description

Functions to graphically analyze a "seas" object.

### Usage

```
## S3 method for class 'seas'
plot(
  x,
  outliers = TRUE,
  trend = FALSE,
  main = "Original and Adjusted Series",
  xlab = "Time",
  ylab = "",
  transform = c("none", "PC", "PCY"),
  ...
)

residplot(
  x,
  outliers = TRUE,
  main = "residuals of regARIMA",
  xlab = "Time",
  ylab = "",
  ...
)

## S3 method for class 'seas'
monthplot(x, choice = c("seasonal", "irregular"), main, ...)
```

### Arguments

|           |   |
|-----------|---|
| x         | an object of class "seas", usually, a result of a call to <a href="#">seas</a> .  |
| outliers  | logical, should the outliers be drawn.  |
| trend     | logical, should the trend be drawn.   |
| main      | character string, title of the graph.   |
| xlab      | character string, title for the x axis.   |
| ylab      | character string, title for the y axis.   |
| transform | character string, optionally transform the data to period to period "PC" or year to year "PCY" percentage change rates. |
| ...       | further arguments passed to the plotting functions.   |
| choice    | character string, "seasonal" (default) or "irregular".  |

## Details

plot calls the plot method for class "seas". It plots the adjusted and unadjusted series, as well as the outliers. Optionally draws the trend series.

residplot plots the residuals and the outliers.

monthplot calls the monthplot method for class "seas". It plot the seasonal and SI component periodwise. Despite its name, monthplot can be used for series of all frequencies.

## Value

All plot functions return a plot as their side effect.

## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[seas](#), for the main function.

[udg](#), for diagnostical statistics.

## Examples

```
## Not run:

m <- seas(AirPassengers)

plot(m)
plot(m, outliers = FALSE)
plot(m, trend = TRUE)

residplot(m)
residplot(m, outliers = FALSE)

monthplot(m)

# use standard R functions to analyze "seas" models
pacf(resid(m))
spectrum(diff(resid(m)))
plot(density(resid(m)))
qqnorm(resid(m))

## End(Not run)
```

---

|              |                                 |
|--------------|---------------------------------|
| predict.seas | <i>Seasonal Adjusted Series</i> |
|--------------|---------------------------------|

---

### Description

Returns the seasonally adjusted series of an (optionally re-evaluated) model of class "seas". Without further arguments, this is equivalent to a call to the [final](#) function.

### Usage

```
## S3 method for class 'seas'  
predict(object, newdata, ...)
```

### Arguments

|         |   |
|---------|---|
| object  | an object of class "seas".  |
| newdata | an object of class "ts". new data values for the x argument in the <a href="#">seas</a> function. |
| ...     | further arguments, passed to <a href="#">update.seas</a> , to re-evaluate the model.              |

### Details

With the newdata argument supplied, the "seas" object is re-evaluated, using the original model call. This is equivalent of calling `final(update(m, x = newdata))`.

### Value

Object of class "ts".

### Examples

```
## Not run:  
# Using data from Dec. 59 to estimate a model  
ap.short <- window(AirPassengers, end = c(1959, 12))  
m <- seas(ap.short)  
predict(m)  
final(m)    # equivalent  
  
# Use Dec. 59 model specification to estimate data up to Dec. 60  
predict(m, AirPassengers)  
  
## End(Not run)
```

**Description**

Main function of the seasonal package. With the default options, seas calls the automatic procedures of X-13ARIMA-SEATS to perform a seasonal adjustment that works well in most circumstances. Via the `...` argument, it is possible to invoke almost all options that are available in X-13ARIMA-SEATS (see details). The default options of seas are listed as explicit arguments and are discussed in the arguments section. A full-featured graphical user interface can be accessed by the [view](#) function.

**Usage**

```
seas(
  x,
  xreg = NULL,
  xtrans = NULL,
  seats.noadmiss = "yes",
  transform.function = "auto",
  regression.aicctest = c("td", "easter"),
  outlier = "",
  automdl = "",
  na.action = na.omit,
  out = FALSE,
  dir = NULL,
  ...,
  list = NULL
)
```

**Arguments**

|                                 |   |
|---------------------------------|---|
| <code>x</code>                  | object of class "ts": time series to seasonally adjust.   |
| <code>xreg</code>               | (optional) object of class "ts": one or several user defined exogenous variables for regARIMA modelling, can be used both with regression or x11regression.   |
| <code>xtrans</code>             | (optional) object of class "ts": one or two user defined exogenous variables for the transform spec. Can be specified together with xreg.   |
| <code>seats.noadmiss</code>     | spec 'seats' with argument noadmiss = "yes" (default). Seasonal adjustment by SEATS, if SEATS decomposition is invalid, an alternative model is used (a message is returned). If noadmiss = "no", no approximation is done. If the seats spec is removed (seats = NULL), no seasonal adjustment is performed. |
| <code>transform.function</code> | spec transform with argument function = "auto" (default). Automatic log transformation detection. Set equal to "none", "log" or any value that is allowed by X-13 to turn it off.   |



|                                 |  |
|---------------------------------|--|
| <code>regression.aictest</code> | spec regression with argument <code>aictest = c("td", "easter")</code> (default). AIC test for trading days and Easter effects. Set equal to NULL to turn it off.  |
| <code>outlier</code>            | spec outlier without arguments (default). Automatic outlier detection. Set equal to NULL to turn it off.   |
| <code>automdl</code>            | spec automdl without arguments (default). Automatic model search with the automdl spec. Set equal to NULL to turn it off.  |
| <code>na.action</code>          | a function which indicates what should happen when the data contain NAs. <code>na.omit</code> (default), <code>na.exclude</code> or <code>na.fail</code> . If <code>na.action = na.x13</code> , NA handling is done by X-13, i.e. NA values are substituted by -99999. |
| <code>out</code>                | logical. Should the X-13ARIMA-SEATS standard output be saved in the "seas" object? (this increases object size substantially, it is recommended to re-evaluate the model using the <code>out</code> function instead.)   |
| <code>dir</code>                | character string with a user defined file path. If specified, the X-13ARIMA-SEATS output files are copied to this folder. Useful for debugging.  |
| <code>...</code>                | additional spec-arguments options sent to X-13ARIMA-SEATS (see details).   |
| <code>list</code>               | a named list with additional spec-arguments options. This is an alternative to the <code>...</code> argument. It is useful for programming.  |

### Details

It is possible to use the almost complete syntax of X-13ARIMA-SEAT via the `...` argument. The syntax of X-13ARIMA-SEATS uses *specs* and *arguments*, and each spec optionally contains some arguments. In `seas`, an additional spec-argument can be added by separating spec and argument by a dot (`.`) (see examples). Alternatively, spec-argument combinations can be supplied as a named list, which is useful for programming.

Similarly, the `series` function can be used to read almost all series from X-13ARIMA-SEATS. The `udg` function provides access to a large number of diagnostic statistics.

For a more extensive description, consider the vignette or the wiki page, which contains replications of almost all examples from the official X-13ARIMA-SEATS manual.

### Value

returns an object of class "seas", essentially a list with the following components:

|                     |   |
|---------------------|---|
| <code>series</code> | a list containing the output tables of X-13. To be accessed by the <code>series</code> function.  |
| <code>data</code>   | seasonally adjusted data, the raw data, the trend component, the irregular component and the seasonal component (deprecated).   |
| <code>err</code>    | warning messages from X-13ARIMA-SEATS   |
| <code>udg</code>    | content of the <code>.udg</code> output file  |
| <code>est</code>    | content of the <code>.est</code> output file  |
| <code>model</code>  | list with the model specification, similar to "spec". It typically contains "regression", which contains the regressors and parameter estimates, and "arima", which contains the ARIMA specification and the parameter estimates. |

|             |   |
|-------------|---|
| fivebestmdl | Best Five ARIMA Models (unparsed)   |
| x           | input series  |
| spc         | object of class "spclist", a list containing the content of the .spc file that is used by X-13ARIMA-SEATS. Each spec is on the first level, each argument is on the second level. |
| call        | function call   |
| wdir        | temporary directory in which X-13ARIMA-SEATS has been run   |

The final function returns the final adjusted series, the plot method shows a plot with the unadjusted and the adjusted series. summary gives an overview of the regARIMA model. The `udg` function returns diagnostical statistics.

## References

Sax C, Eddelbuettel D (2018). "Seasonal Adjustment by X-13ARIMA-SEATS in R." *Journal of Statistical Software*, 87(11), 1-17. doi: 10.18637/jss.v087.i11 (<http://doi.org/10.18637/jss.v087.i11>).

On-Line Interface to seasonal <http://www.seasonal.website>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

`view`, for accessing the graphical user interface.

`update.seas`, to update an existing "seas" model.

`static`, to return the 'static' call, with automated procedures substituted by their choices.

`series`, for universal X-13 table series import.

`out`, to view the full X-13 diagnostical output.

## Examples

```
## Not run:
Basic call
m <- seas(AirPassengers)
summary(m)

# Graphical user interface
view(m)

# invoke X-13ARIMA-SEATS options as 'spec.argument' through the ... argument
# (consult the X-13ARIMA-SEATS manual for many more options and the list of
# R examples for more examples)
seas(AirPassengers, regression.aictest = c("td")) # no easter testing
seas(AirPassengers, force.type = "denton") # force equality of annual values
seas(AirPassengers, x11 = "") # use x11, overrides the 'seats' spec
```

```

# 'spec.argument' combinations can also be supplied as a named list, which is
# useful for programming
seas(AirPassengers, list = list(regression.aictest = c("td"), outlier = NULL))
# constructing the list step by step
ll <- list()
ll[["x"]] <- AirPassengers
ll[["regression.aictest"]] <- "td"
ll["outlier"] <- list(NULL) # assigning NULL to a list using single brackets
seas(list = ll)

# options can be entered as vectors
seas(AirPassengers, regression.variables = c("td1coef", "easter[1]"))
seas(AirPassengers, arima.model = c(0, 1, 1, 0, 1, 1))
seas(AirPassengers, arima.model = "(0 1 1)(0 1 1)" # equivalent

# turn off the automatic procedures
seas(AirPassengers, regression.variables = c("td1coef", "easter[1]",
"ao1951.May"), arima.model = "(0 1 1)(0 1 1)", regression.aictest = NULL,
outlier = NULL, transform.function = "log")

# static replication of 'm <- seas(AirPassengers)'
static(m) # this also tests the equivalence of the static call
static(m, test = FALSE) # no testing (much faster)
static(m, coef = TRUE) # also fixes the coefficients

# updating an existing model
update(m, x11 = "")

# specific extractor functions
final(m)
predict(m) # equivalent
original(m)
resid(m)
coef(m)
fivebestmdl(m)
out(m) # the X-13 .out file (see ?out, for details)
spc(m) # the .spc input file to X-13 (for debugging)

# universal extractor function for any X-13ARIMA-SEATS output (see ?series)
series(m, "forecast.forecasts")

# copying the output of X-13 to a user defined directory
seas(AirPassengers, dir = "~/mydir")

# user defined regressors (see ?genhol for more examples)
# a temporary level shift in R base
tls <- ts(0, start = 1949, end = 1965, freq = 12)
window(tls, start = c(1955, 1), end = c(1957, 12)) <- 1
seas(AirPassengers, xreg = tls, outlier = NULL)
# identical to a X-13ARIMA-SEATS specification of the the level shift
seas(AirPassengers, regression.variables = c("t11955.01-1957.12"),
outlier = NULL)

```

```

# forecasting an annual series without seasonal adjustment
m <- seas(airmiles, seats = NULL, regression.aictest = NULL)
series(m, "forecast.forecasts")

# NA handling
AirPassengersNA <- window(AirPassengers, end = 1962, extend = TRUE)
final(seas(AirPassengersNA, na.action = na.omit)) # no NA in final series
final(seas(AirPassengersNA, na.action = na.exclude)) # NA in final series
# final(seas(AirPassengersNA, na.action = na.fail)) # fails

# NA handling by X-13 (works with internal NAs)
AirPassengersNA[20] <- NA
final(seas(AirPassengersNA, na.action = na.x13))

## performing 'composite' adjustment
m.direct <- seas(ldeaths, x11 = "")
final.direct <- final(m.direct)
m.indirect <- lapply(list(mdeaths, fdeaths), seas, x11 = "")

# not very efficient, but keeps time series properties
final.indirect <- Reduce(`+`, lapply(m.indirect, final))

ts.plot(cbind(final.indirect, final(m.direct)), col = 1:2)
legend("topright", legend = c("disaggregated", "aggregated"), lty = 1, col = 1:2)

## End(Not run)

```

---

series

---

*Import X-13ARIMA-SEATS Output Tables*


---

## Description

With the exception of the composite spec, the series function imports all tables that can be saved in X-13ARIMA-SEATS.

## Usage

```
series(x, series, reeval = TRUE, verbose = TRUE)
```

## Arguments

|         |   |
|---------|---|
| x       | an object of class "seas".  |
| series  | character vector, short or long names of an X-13ARIMA-SEATS table. If a long name is specified, it needs to be combined with the spec name and separated by a dot (it is not unique, otherwise. See list below.). More than one series can be specified (see examples). |
| reeval  | logical, if TRUE, the model is re-evaluated with the corresponding specs enabled.   |
| verbose | logical, if TRUE, a message is returned if a spec is added during reevaluation.   |

**Details**

If the `save` argument is not specified in the model call, `series` re-evaluates the call with the corresponding specs enabled (also returning a message). Note that re-evaluation doubles the overall computational time. If you want to accelerate the procedure, you have to be explicit about the output in the model call (see examples).

List of all importable tables from X-13ARIMA-SEATS:

| <b>spec</b> | <b>long name</b>           | <b>short name</b> |
|-------------|----------------------------|-------------------|
| check       | check.acf                  | acf               |
| check       | check.acfsquared           | ac2               |
| check       | check.pacf                 | pcf               |
| estimate    | estimate.armacmatrix       | acm               |
| estimate    | estimate.iterations        | itr               |
| estimate    | estimate.regcmatrix        | rcm               |
| estimate    | estimate.regressioneffects | ref               |
| estimate    | estimate.residuals         | rsd               |
| estimate    | estimate.roots             | rts               |
| force       | force.forcefactor          | ffc               |
| force       | force.revsachanges         | e6a               |
| force       | force.rndsachanges         | e6r               |
| force       | force.saround              | rnd               |
| force       | force.seasadjtot           | saa               |
| forecast    | forecast.backcasts         | bct               |
| forecast    | forecast.forecasts         | fct               |
| forecast    | forecast.transformed       | ftf               |
| forecast    | forecast.transformedbcst   | btr               |
| forecast    | forecast.variances         | fvr               |
| history     | history.chngestimates      | che               |
| history     | history.chngrevisions      | chr               |
| history     | history.fcsterrors         | fce               |
| history     | history.fcsthhistory       | fch               |
| history     | history.indsaestimates     | iae               |
| history     | history.indsaerevisions    | iar               |
| history     | history.lkhdhistory        | lkh               |
| history     | history.outlierhistory     | rot               |
| history     | history.saestimates        | sae               |
| history     | history.sarevisions        | sar               |
| history     | history.seatsmdlhistory    | smh               |
| history     | history.sfestimates        | sfe               |
| history     | history.sfilterhistory     | sfh               |
| history     | history.sfrevisions        | sfr               |
| history     | history.trendchngestimates | tce               |
| history     | history.trendchngrevisions | tcr               |
| history     | history.trendestimates     | tre               |
| history     | history.trendrevisions     | trr               |
| identify    | identify.acf               | iac               |
| identify    | identify.pacf              | ipc               |
| outlier     | outlier.finaltests         | fts               |

|              |                             |     |
|--------------|-----------------------------|-----|
| outlier      | outlier.iterations          | oit |
| regression   | regression.aoutlier         | ao  |
| regression   | regression.holiday          | hol |
| regression   | regression.levelshift       | ls  |
| regression   | regression.outlier          | otl |
| regression   | regression.regressionmatrix | rmx |
| regression   | regression.regseasonal      | a10 |
| regression   | regression.seasonaloutlier  | so  |
| regression   | regression.temporarychange  | tc  |
| regression   | regression.tradingday       | td  |
| regression   | regression.transitory       | a13 |
| regression   | regression.userdef          | usr |
| seats        | seats.adjustfac             | s16 |
| seats        | seats.adjustmentratio       | s18 |
| seats        | seats.cycle                 | cyc |
| seats        | seats.diffseasonaladj       | dsa |
| seats        | seats.difftrend             | dtr |
| seats        | seats.irregular             | s13 |
| seats        | seats.longtermtrend         | ltt |
| seats        | seats.seasadjconst          | sec |
| seats        | seats.seasonal              | s10 |
| seats        | seats.seasonaladj           | s11 |
| seats        | seats.seasonaladjfcstdecomp | afd |
| seats        | seats.seasonalfcstdecomp    | sfd |
| seats        | seats.seasonalsum           | ssm |
| seats        | seats.seriesfcstdecomp      | ofd |
| seats        | seats.totaladjustment       | sta |
| seats        | seats.transitory            | s14 |
| seats        | seats.transitoryfcstdecomp  | yfd |
| seats        | seats.trend                 | s12 |
| seats        | seats.trendconst            | stc |
| seats        | seats.trendfcstdecomp       | tfd |
| series       | series.adjoriginal          | b1  |
| series       | series.calendaradjorig      | a18 |
| series       | series.outlieradjorig       | a19 |
| series       | series.seriesmvdj           | mv  |
| series       | series.span                 | a1  |
| slidingspans | slidingspans.chngspans      | chs |
| slidingspans | slidingspans.indchngspans   | cis |
| slidingspans | slidingspans.indsaspsans    | ais |
| slidingspans | slidingspans.indsfspans     | sis |
| slidingspans | slidingspans.indychngspans  | yis |
| slidingspans | slidingspans.sfspans        | sfs |
| slidingspans | slidingspans.tdspans        | tds |
| slidingspans | slidingspans.ychngspans     | yes |
| spectrum     | spectrum.speccomposite      | is0 |
| spectrum     | spectrum.specindir          | is2 |
| spectrum     | spectrum.specindsa          | is1 |

|           |                                |     |
|-----------|--------------------------------|-----|
| spectrum  | spectrum.specirr               | sp2 |
| spectrum  | spectrum.specorig              | sp0 |
| spectrum  | spectrum.specresidual          | spr |
| spectrum  | spectrum.specsa                | sp1 |
| spectrum  | spectrum.specseatsextresiduals | ser |
| spectrum  | spectrum.specseatsirr          | s2s |
| spectrum  | spectrum.specseatsssa          | s1s |
| transform | transform.permprior            | a2p |
| transform | transform.permprioradjusted    | a3p |
| transform | transform.permprioradjustedptd | a4p |
| transform | transform.prior                | a2  |
| transform | transform.prioradjusted        | a3  |
| transform | transform.prioradjustedptd     | a4d |
| transform | transform.seriesconstant       | a1c |
| transform | transform.tempprior            | a2t |
| transform | transform.transformed          | trn |
| x11       | x11.adjoriginalc               | c1  |
| x11       | x11.adjoriginald               | d1  |
| x11       | x11.adjustdiff                 | fad |
| x11       | x11.adjustfac                  | d16 |
| x11       | x11.adjustmentratio            | e18 |
| x11       | x11.biasfactor                 | bcf |
| x11       | x11.calendar                   | d18 |
| x11       | x11.calendaradjchanges         | e8  |
| x11       | x11.combholiday                | chl |
| x11       | x11.extreme                    | c20 |
| x11       | x11.extremeb                   | b20 |
| x11       | x11.irregular                  | d13 |
| x11       | x11.irregularadjao             | iao |
| x11       | x11.irregularb                 | b13 |
| x11       | x11.irregularc                 | c13 |
| x11       | x11.irrwt                      | c17 |
| x11       | x11.irrwtb                     | b17 |
| x11       | x11.mcdmovavg                  | f1  |
| x11       | x11.modirregular               | e3  |
| x11       | x11.modoriginal                | e1  |
| x11       | x11.modseasadj                 | e2  |
| x11       | x11.modsic4                    | c4  |
| x11       | x11.modsid4                    | d4  |
| x11       | x11.origchanges                | e5  |
| x11       | x11.replacsi                   | d9  |
| x11       | x11.replacsic9                 | c9  |
| x11       | x11.robustsa                   | e11 |
| x11       | x11.sachanges                  | e6  |
| x11       | x11.seasadj                    | d11 |
| x11       | x11.seasadjb11                 | b11 |
| x11       | x11.seasadjb6                  | b6  |
| x11       | x11.seasadjc11                 | c11 |

|               |                                  |     |
|---------------|----------------------------------|-----|
| x11           | x11.seasadjc6                    | c6  |
| x11           | x11.seasadjconst                 | sac |
| x11           | x11.seasadjd6                    | d6  |
| x11           | x11.seasonal                     | d10 |
| x11           | x11.seasonaladjregsea            | ars |
| x11           | x11.seasonalb10                  | b10 |
| x11           | x11.seasonalb5                   | b5  |
| x11           | x11.seasonalc10                  | c10 |
| x11           | x11.seasonalc5                   | c5  |
| x11           | x11.seasonald5                   | d5  |
| x11           | x11.seasonaldi\_                 | fsd |
| x11           | x11.sib3                         | b3  |
| x11           | x11.sib8                         | b8  |
| x11           | x11.tdadjorig                    | c19 |
| x11           | x11.tdadjorigb                   | b19 |
| x11           | x11.totaladjustment              | tad |
| x11           | x11.trend                        | d12 |
| x11           | x11.trendadjls                   | tal |
| x11           | x11.trendb2                      | b2  |
| x11           | x11.trendb7                      | b7  |
| x11           | x11.trendc2                      | c2  |
| x11           | x11.trendc7                      | c7  |
| x11           | x11.trendchanges                 | e7  |
| x11           | x11.trendconst                   | tac |
| x11           | x11.trendd2                      | d2  |
| x11           | x11.trendd7                      | d7  |
| x11           | x11.unmodsi                      | d8  |
| x11           | x11.unmodsiox                    | d8b |
| x11           | x11.yrtotals                     | e4  |
| x11regression | x11regression.calendar           | xca |
| x11regression | x11regression.calendarb          | bxc |
| x11regression | x11regression.combcalendar       | xcc |
| x11regression | x11regression.combcalendarb      | bcc |
| x11regression | x11regression.combtradingday     | c18 |
| x11regression | x11regression.combtradingdayb    | b18 |
| x11regression | x11regression.extremeval         | c14 |
| x11regression | x11regression.extremevalb        | b14 |
| x11regression | x11regression.holiday            | xh1 |
| x11regression | x11regression.holidayb           | bxb |
| x11regression | x11regression.outlieriter        | xoi |
| x11regression | x11regression.priortd            | a4  |
| x11regression | x11regression.tradingday         | c16 |
| x11regression | x11regression.tradingdayb        | b16 |
| x11regression | x11regression.x11reg             | c15 |
| x11regression | x11regression.x11regb            | b15 |
| x11regression | x11regression.xregressioncmatrix | xrc |
| x11regression | x11regression.xregressionmatrix  | xrm |



**Value**

depending on the table, either an object of class "ts" or "data.frame".

**References**

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

**See Also**

[seas](#) for the main function.

**Examples**

```
## Not run:

m <- seas(AirPassengers)
series(m, "fct") # re-evaluate with the forecast spec activated

# more than one series
series(m, c("rsd", "fct"))

m <- seas(AirPassengers, forecast.save = "fct")
series(m, "fct") # no re-evaluation (much faster!)

# using long names
series(m, "forecast.forecasts")

# history spec
series(m, "history.trendestimates")
series(m, "history.sfestimates")
series(m, "history.saestimates")
series(m, c("history.sfestimates", "history.trendestimates"))

# slidingspans spec
series(m, "slidingspans.sfspans")
series(m, "slidingspans.tdspans")

# fundamental identities of seasonal adjustment
#  $Y = T * I * (S * TD)$ 
all.equal(AirPassengers, series(m, "seats.trend") *
           series(m, "seats.irregular") * series(m, "seats.adjustfac"))
#  $Y_{sa} = Y / (S * TD)$ 
all.equal(final(m), AirPassengers / series(m, "seats.adjustfac"))

### Some X-13ARIMA-SEATS functions can be replicated in R:

# X-13ARIMA-SEATS spectrum
```

```
plot(series(m, "spectrum.specorig")[,-1], t = "l")
# R equivalent: spectrum from stats
spectrum(diff(log(AirPassengers)), method = "ar")

# X-13ARIMA-SEATS pacf
x13.pacf <- series(m, "identify.pacf")
plot(x13.pacf[,1], t = "h")
lines(x13.pacf[,2])
lines(-x13.pacf[,2])
# R equivalent: pacf from stats
pacf(AirPassengers, lag.max = 35)

## End(Not run)
```

---

|     |                          |
|-----|--------------------------|
| spc | <i>.spc File Content</i> |
|-----|--------------------------|

---

## Description

Access the content of the `.spc` file that governs the behavior of X-13ARIMA-SEATS.

## Usage

```
spc(x)
```

## Arguments

|   |                        |
|---|------------------------|
| x | object of class "seas" |
|---|------------------------|

## Value

returns an object of class "spclist", essentially a list that contains the information that is sent to X-13ARIMA-SEATS. The corresponding print method displays the content of the list as written to the `.spc` file.

## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[seas](#) for the main function.

[series](#), for universal X-13 output extraction.

[plot.seas](#), for diagnostical plots.

[out](#), for accessing the full output of X-13ARIMA-SEATS.

**Examples**

```
## Not run:  
  
m <- seas(AirPassengers)  
spc(m)  
  
## End(Not run)
```

---

SPECS

*List of Available X-13ARIMA-SEATS Outputs*

---

**Description**

The data is used by several functions as a look-up table. Users should consider the table in [series](#) or in the official manual.

**Format**

An object of class "data.frame"

**Source**

United States Census Bureau

**References**

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

---

static

*Static Call of a seas Object*

---

**Description**

In a 'static' call, the default automatic procedures in the model call are substituted by the choices they made.

**Usage**

```
static(  
  x,  
  coef = FALSE,  
  x11.filter = FALSE,  
  test = TRUE,  
  fail = FALSE,  
  evaluate = FALSE  
)
```

## Arguments

|                         |   |
|-------------------------|---|
| <code>x</code>          | an object of class <code>seas</code> .  |
| <code>coef</code>       | logical. If TRUE, the coefficients are treated as fixed, instead of being estimated.  |
| <code>x11.filter</code> | logical. X-11 only. if TRUE, the X-11 moving averages will be fixed as well. This leads to different filters at different stages, and the resulting series can be slightly different. If <code>test = TRUE</code> , this may cause a warning message. |
| <code>test</code>       | logical. By default the static call is executed and compared to the input call. If the final series is not identical, a message is returned. If FALSE, no test is performed (faster).   |
| <code>fail</code>       | logical. If TRUE, differences will cause an error. Ignored if <code>test = FALSE</code> .   |
| <code>evaluate</code>   | logical. If TRUE, the call is evaluated.  |

## Details

If `evaluate = TRUE`, the call is evaluated. The call can be copy/pasted to a script and used for further manipulations or future evaluation of the same model.

By default, the static call is tested. It is executed and compared to the input call. If the final series is not identical, a message is returned.

If `coef = TRUE`, the coefficients are fixed as well. If `x11.filter = TRUE`, the X-11 moving averages are fixed as well.

## Value

Object of class `"call"`. Or an object of class `"seas"` if `evaluate = TRUE`.

## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[getCall](#) to extract the actual call.

[seas](#) for the main function of seasonal.

## Examples

```
## Not run:

m <- seas(AirPassengers)
getCall(m)           # default call
static(m)            # static call
static(m, test = FALSE) # much faster
static(m, evaluate = TRUE) # returns an object of class "seas"
```

```

m <- seas(AirPassengers, x11 = "")

static(m, x11.filter = TRUE) # also fixes the X-11 filter (with a warning)
static(m, coef = TRUE)      # also fixes the coefficients

## End(Not run)

```

---

summary.seas

---

*Summary of a X13-ARIMA-SEATS seasonal adjustment*


---

## Description

Like the corresponding method for "lm" objects, the method for "seas" objects returns the estimated coefficients, its standard errors, z-statistics and corresponding (two-sided) p-values. Coefficients are returned both for the exogenous regressors and the coefficients of the ARIMA model.

## Usage

```

## S3 method for class 'seas'
summary(object, stats = getOption("seas.stats"), ...)

## S3 method for class 'summary.seas'
print(
  x,
  digits = max(3, getOption("digits") - 3),
  signif.stars = getOption("show.signif.stars"),
  ...
)

```

## Arguments

|              |  |
|--------------|--|
| object       | an object of class "seas", usually, a result of a call to <a href="#">seas</a> .   |
| stats        | (experimental) character vector, additional stat to be shown in the summary output. function. For a list of all possible values, see the <a href="#">udg</a> function. If a value is not present, it will be ignored. Values can be specified via options. See examples. |
| ...          | further arguments passed to or from other methods.   |
| x            | an object of class "summary.seas", usually, a result of a call to <code>summary.seas</code> .  |
| digits       | the number of significant digits to use when printing.   |
| signif.stars | logical. If TRUE, 'significance stars' are printed for each coefficient.   |

## Details

The lower part of the output shows additional information on the estimation:

**Adjustment** use of SEATS or X11

**ARIMA** structure of the seasonal ARIMA model

**Obs.** number of observations

**Transform** prior transformation

**AICc, BIC** value of the information criterion (lower is better)

**QS** test for seasonality in the final series; null hypothesis: no seasonality in final; signif. codes are shown if the null hypothesis is rejected. QS statistics for more series (e.g., the original series) can be extracted with `qs`.

**Box-Ljung** test for residual autocorrelation; null hypothesis: no autocorrelation in residuals; signif. codes are shown if the null hypothesis is rejected. The test statistic is the result of `Box.test(resid(m), lag = 24, type = "Ljung")`

**Shapiro** test for normality of the residuals; null hypothesis: normal distribution of the residuals; signif. codes are shown if the null hypothesis is rejected. The test statistic is the result of `shapiro.test(resid(m))`

## Value

`summary.seas` returns a list containing the summary statistics included in `object`, and computes the following additional statistics:

`coefficients` a named matrix containing coefficients, standard deviations, t-values and p-values

`transform` character string with the type of initial transformation

The print method prints the summary output in a similar way as the method for `"lm"`.

## Examples

```
## Not run:
m <- seas(AirPassengers)
summary(m)

### user defined stats from the udg function
# (experimental, see ?udg)

# also show some M quality statistics for X11 in summary
options(seas.stats = c("f3.m01", "f3.m02", "f3.m03", "f3.m04"))
summary(seas(AirPassengers, x11 = ""))

# this does not affect the SEATS output
summary(seas(AirPassengers))

# reset to default
options(seas.stats = NULL)

## End(Not run)
```

---

|                   |                               |
|-------------------|-------------------------------|
| transformfunction | <i>Applied Transformation</i> |
|-------------------|-------------------------------|

---

### Description

Returns the transform function that has been applied.

### Usage

```
transformfunction(x)
```

### Arguments

x                    object of class "seas"

### References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

### See Also

[seas](#) for the main function.

[series](#), for universal X-13 output extraction.

[plot.seas](#), for diagnostical plots.

[out](#), for accessing the full output of X-13ARIMA-SEATS.

### Examples

```
## Not run:  
  
m <- seas(AirPassengers)  
transformfunction(m)  
  
## End(Not run)
```

**Description**

The `udg` function provides access to a large number of diagnostical statistics. The `qs` function and the `AIC`, `BIC` and `logLik` methods are wrappers that use `udg` to access some specific diagnostical statistics.

**Usage**

```
udg(x, stats = NULL, simplify = TRUE, fail = TRUE)
```

```
qs(x)
```

```
## S3 method for class 'seas'  
AIC(object, ...)
```

```
## S3 method for class 'seas'  
BIC(object, ...)
```

```
## S3 method for class 'seas'  
nobs(object, ...)
```

```
## S3 method for class 'seas'  
logLik(object, ...)
```

**Arguments**

|                        |  |
|------------------------|--|
| <code>x, object</code> | an object of class "seas".   |
| <code>stats</code>     | character vector; if specified, only a subset of the available stats are returned. This speeds up the call, as only a subset needs to be type converted. Should be used for programming. |
| <code>simplify</code>  | logical; should the result be simplified to a vector or matrix, if possible?   |
| <code>fail</code>      | logical; if TRUE, an error is dropped if an element of <code>stats</code> is missing in <code>names(udg(x))</code> .   |
| <code>...</code>       | further arguments (not used)   |

**Value**

`qs` returns the QS statistics for seasonality of input and output series and the corresponding p-values. `AIC`, `BIC`, `nobs` and `logLik` return the corresponding statistics.



## References

Vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Comprehensive list of R examples from the X-13ARIMA-SEATS manual: <http://www.seasonal.website/examples.html>

Official X-13ARIMA-SEATS manual: <https://www.census.gov/ts/x13as/docX13ASHTML.pdf>

## See Also

[seas](#) for the main function.

[series](#), for universal X-13 output extraction.

[plot.seas](#), for diagnostical plots.

[out](#), for accessing the full output of X-13ARIMA-SEATS.

## Examples

```
## Not run:
m <- seas(AirPassengers, x11 = "")

qs(m)
AIC(m)
BIC(m)
nobs(m)
logLik(m)

# a list with all entries from udg
udg(m)

# extracting a few selected stats from udg
udg(m, c("f3.m02", "f3.m05", "qsori")) # returns a list
udg(m, c("f3.m02", "f3.m05"))        # returns a vector

# faster than:
udg(m)[c("f3.m01", "f3.m02", "qsori")]

## End(Not run)
```

---

unemp

*United States Unemployment Level*

---

## Description

Thousands of Persons

## Format

Each time series is an object of class "ts".

**Source**

U.S. Bureau of Labor Statistics, retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/LNU03000000>, December 14, 2016.

**Examples**

```
data(seasonal)
unemp
```

---

```
update.seas
```

*Update and Re-evaluate a Seasonal Adjustment Model*

---

**Description**

Method to update and re-evaluate an object of class "seas".

**Usage**

```
## S3 method for class 'seas'
update(object, ..., evaluate = TRUE)
```

**Arguments**

|          |   |
|----------|---|
| object   | an object of class "seas", usually, a result of a call to <a href="#">seas</a> .      |
| ...      | spec-argument options sent to X-13 (with the same syntax as in <a href="#">seas</a> ) |
| evaluate | logical. If TRUE, the call is evaluated.  |

**Details**

Contrary to the default method of [update](#), the "seas" method uses the evaluated call, rather than the actual call for re- evaluation. This means you can safely use it in other functions, which is useful with [lapply](#) and friends (see examples.)

**Value**

Object of class "seas". Or an object of class "call" if evaluate = FALSE.

**See Also**

[seas](#) for the main function.

[static](#), to return the (optionally evaluated) static call of a "seas" object.

## Examples

```
## Not run:
# updating the call
m <- seas(AirPassengers)
update(m, x11 = "")
update(m, x = sqrt(AirPassengers), x11 = "")

# 'update' can be also used with lapply (or mapply)

# a list of time series
dta <- list(fdeaths = fdeaths, mdeaths = mdeaths)

# use 'seas' via lapply
ll <- lapply(dta, seas, x11 = "")

# use 'update' via lapply
lapply(ll, update, arima.model = c(0, 1, 1, 0, 1, 1))

## End(Not run)
```

---

view

*Interactively Modify a Seasonal Adjustment Model*

---

## Description

Interactively modify a "seas" object. The goal of `view` is to summarize all relevant options, plots and statistics of a seasonal adjustment model. The `view` function in the **seasonal** package imports the identical `view` function from the **seasonalview** package, so there is no need to explicitly load the **seasonalview** package.

## Usage

```
view(x = NULL, story = NULL, quiet = TRUE, ...)
```

## Arguments

|                    |  |
|--------------------|--|
| <code>x</code>     | an object of class "seas".   |
| <code>story</code> | character, local file path or URL to an ".Rmd" file.   |
| <code>quiet</code> | logical, if TRUE (default), error messages from calls in <code>view</code> are not shown in the console.                           |
| <code>...</code>   | arguments passed to <code>runApp</code> . E.g., for selecting if the GUI should open in the browser or in the RStudio viewer pane. |

## Details

Frequently used options can be modified using the drop down selectors in the upper left box. Each change will result in a re-estimation of the seasonal adjustment model. The R-call, the X-13 call, the graphical output and the summary are updated accordingly.

Alternatively, the R call can be modified manually in the lower left box. Click 'Run Call' to re-estimate the model and to adjust the option selectors, the graphical output, and the summary. With the 'To console' button, the GUI is closed and the call is imported to R. The 'Static' button substitutes automatic procedures by the automatically chosen spec-argument options, in the same way as the `static` function.

If you are familiar with the X-13 spec syntax, you can modify the X-13 call, with the same consequences as when modifying the R call.

The lower right panel shows the summary, as described in the help page of `summary.seas`. The 'X-13 output' button opens the complete output of X-13 in a separate tab or window.

If you have the `x13story` package installed (not yet on CRAN, see references), you can call the function with the `story` argument. This will render an R Markdown document and produce a *story* on seasonal adjustment that can be manipulated interactively.

## Value

`view` returns an object of class "seas", the modified model; or NULL, if the `story` argument is supplied.

## References

Seasonal vignette with a more detailed description: <http://www.seasonal.website/seasonal.html>

Development version of the `x13story` package: <https://github.com/christoph sax/x13story>

## Examples

```
## Not run:

m <- seas(AirPassengers)
view(m)

# store the model after closing the GUI, for further processing in R
m.upd <- view(m)

## End(Not run)
```

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