seasonal: R interface to X-13ARIMA-SEATS

seasonal is an easy-to-use R-interface to **X-13ARIMA-SEATS**, a seasonal adjustment software **produced, distributed, and maintained by the United States Census Bureau**. X-13ARIMA-SEATS combines and extends the capabilities of the older X-12ARIMA (developed by the Census Bureau) and the TRAMO-SEATS (developed by the Bank of Spain) software packages.

If you are new to seasonal adjusmtent and X-13ARIMA-SEATS, you may use the automated procedures to quickly produce seasonal adjustements of some time series. The default settings in the core function generally do a very good job. Start with the *installation* and *getting started* section and skip the rest.

If you are familiar with seasonal adjusmtent and already know something about X-13ARIMA-SEATS, you may benefit from the very close relationship between the syntax in seasonal and X-13ARIMA-SEATS. Study the *X-13ARIMA-SEATS syntax* section and have a look at the wiki, where most examples from the original X-13ARIMA-SEATS manual are reproduced in R. For more details on X-13ARIMA-SEATS, as well as for explanations on the X-13ARIMA-SEATS syntax, see the manual or the quick reference.

Installation

To install directly from github to R, substitute your github `'USERNAME'` and `'PASSWORD'`:

```
require(devtools)
install_github('seasonal', 'christophsax', auth_user = 'USERNAME', password = 'PASSWORD')
```

seasonal includes the binary files of X-13ARIMA-SEATS. **No separate download of the binaries is needed.**

Getting started

`seas` ist the core function of the seasonal package. By default, `seas` calls the automatic procedures of X-13ARIMA-SEATS to perform a seasonal adjustment that works very well in most circumstances. It returns an object of class `seas` that contains all necessary information on the adjustment process, as well as the series. The `predict` method for `seas` objects returns the adjusted series, the `plot` method shows a plot with the unadjusted and the adjusted series.

```
x <- seas(AirPassengers)
predict(x)
plot(x)
```

The first argument must be a time series of class `ts`. By default, `seas` calls the SEATS adjustment procedure. If you prefer the X11 adjustment filter, use the following option (see the next section for details on the syntax):

```
seas(AirPassengers, x11 = list())
```

Besides performing seasonal adjustment with SEATS, a default call of `seas` invokes the following automatic procedures of X-13ARIMA-SEATS: - ARIMA model search - Outlier detection - Detection of trading day and Easter effects

Alternatively, all inputs may be entered manually, as in the following example:

```
seas(AirPassengers,
     regression.variables = c("td1coef", "easter[1]", "ao1951.May"),
     arima.model = "(0 1 1)(0 1 1)",
     regression.aictest = NULL, outlier.types = "none"
)
```

The `static` command reveals the static call from above that is needed to replicate an automatic seasonal adjustment procedure:

```
static(x)
static(x, static.coeff = TRUE)  # also fixes the coefficients
```

If you are using R Studio, the `inspect` command offers a way to analyze and modify a seasonal adjustment procedure (see the section below for details):

```
inspect(x)
```

X-13ARIMA-SEATS syntax

Seasonal uses the same syntax as X-13ARIMA-SEATS. It is possible to invoke most options that are available in X-13ARIMA-SEATS. For details on the options, see the manual. The X-13ARIMA-SEATS syntax uses *specs* and *arguments*, while each spec may contain some arguments. **An additional spec/argument can be added to the `seas` function by separating spec and argument by a `..`** For example, in order to set the `variable` argument of the `regression` spec equal to `td` and `ao1999.jan`, the input to `seas` looks like this:

```
x <- seas(AirPassengers, regression.variable = c("td", "ao1965.jan"))
```

Note that R vectors may be used as an input. If a `spec` is added without any arguments, the `spec` should be set equal to an empty `list()`. Several defaults of `seas` are such empty lists, like the default `seats = list()`. See the help page (`?seas`) for more details on the defaults.

It is possible to manipulate almost all inputs to X-13ARIMA-SEATS this way. Most examples in the manual are replicable in R. For instance, example 1 in section 7.1,

```
series { title  =  "Quarterly Grape Harvest" start = 1950.1
       period =  4
       data   = (8997 9401 ... 11346) }
arima { model = (0 1 1) }
estimate { }
```

translates to R in the following way:

```
seas(AirPassengers,
     x11 = list(),
     arima.model = "(0 1 1)"
)
```

`seas` takes care of the `series` spec, so no input beside the time series has to be provided. As `seas` uses the SEATS procedure by default, the use of X11 has to be specified manually. When the `x11` spec is added as the input (as above), the mutually exlusive and default `seats` spec is automatically disabled. With `arima.model`, an additional spec/argument entry is added to the input of X-13ARIMA-SEATS. As the spec cannot be used with the default `automdl` spec, the latter is automatically disabled. The best way to learn about the relationship between the syntax of X-13ARIMA-SEATS and seasonal is to study the growing list of examples in the wiki.

Priority rules There are several mutually exclusive specs in X-13ARIMA-SEATS. If more than one mutually exclusive specs are included, X-13ARIMA-SEATS leads to an error. In contrast, `seas` follows a set of priority rules, where a lower priority is overwritten by a higher priority. Usually, the default has the lowest priority, and is overwritten if one or several of the following `spec` inputs are provided:

Model selection 1. `arima` 2. `pickmdl` 3. `automdl` (default)

Adjustment procedure 1. `x11` 2. `seats` (default)

Regression procedure 1. `x11regression` 2. `regression` (default)

Output

`seas` returns an object of class `seas`, which is basically a list with the following elements:

Element	Description
`data`	An object of class `ts`, containing the seasonally adjusted data, the raw data, the trend component,
`spc`	An object of class `spclist`, a list containing everything that is send to X-13ARIMA-SEATS. Each
`mdl`	A list with the model specification, similar to `spc`. It typically contains `regression`, which contain

Graphs

Inspect tool

The future

License

When released, the R code in seasonal is licensed under GPL-3. The package contains the X-13ARIMA-SEATS binary files from the United States Census Bureau, which are in the public domain. According to the manual (page 1):

> When it is released, the X-13ARIMA-SEATS program will be in the public domain, and may be copied or transferred.