seasonal is an easy-to-use and full-featured R-interface to X-13ARIMA-SEATS, the seasonal adjustment software developed by the United States Census
Bureau. The latest CRAN version of seasonal makes it much easier to adjust multiple time series.

seasonal depends on the x13binary package to access pre-built binaries of X-13ARIMA-SEATS on all platforms and does not require any manual installation. To install both packages:

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

`seas` is 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 well in most circumstances:

```
seas(AirPassengers)
```

For a more detailed introduction, read our article in the *Journal of Statistical Software*.

Multiple Series Adjusmtent

In the latest CRAN version 1.8, it is now possible to seasonally adjust multiple series in a single call to `seas()`. This is done by using the built-in batch mode of X-13. It removes the need for loops or `lapply()` in such cases, and finally brings one missing feature of X-13 to seasonal – the *composite* spec.

Multiple adjustments can be performed by supplying multiple time series as an `"mts"` object:

```
library(seasonal)
m <- seas(cbind(fdeaths, mdeaths), x11 = "")
final(m)
```

This will perform two seasonal adjustments, one for `fdeaths` and one for `mdeaths`. X-13 spec-argument combinations can be applied in the usual way, such as `x11 = ""`. Note that if entered that way, they will apply to both series. The vignette on multiple adjustments describes how to specify options for individual series.

Backend

X-13 ships with a batch mode that allows multiple adjustments in a single call to X-13. This is now the default in seasonal (`multimode = "x13"`). Alternatively, X-13 can be called for each series (`multimode = "R"`). The results should be usually the same, but switching to `multimode = "R"` may be useful for debugging:

```
seas(cbind(fdeaths, mdeaths), multimode = "x13")
seas(cbind(fdeaths, mdeaths), multimode = "R")
```

In general, `multimode = "x13"` is faster. The following comparison on a MacBook Pro shows a modest speed gain, but bigger differences have been observed on other systems:

```
many <- rep(list(fdeaths), 100)
system.time(seas(many, multimode = "x13"))
#    user  system elapsed
#   9.415   0.653  10.079
```

```
system.time(seas(many, multimode = "R"))
#   user  system elapsed
# 11.130   1.039  12.324
```

composite spec

Support for the X-13 batch mode makes it finally possible to use the *composite* spec – the one feature of X-13 that was missing in seasonal. Sometimes, one has to decide whether seasonal adjustment should be performed on a granular level or on an aggregated level. The *composite* spec helps you to analyze the problem and to compare the direct and the indirect adjustment.

The `composite` argument is a list with an X-13 specification that is applied on the aggregated series. Specification works identical as for other series in `seas()`, including the application of the defaults. If you provide an empty list, the usual defaults of `seas()` are used. A minimal composite call looks like this:

```
seas(
  cbind(mdeaths, fdeaths),
  composite = list(),
  series.comptype = "add"
)
```

You can verify that the composite refers to the total of `mdeaths` and `fdeaths` by running:

```
seas(ldeaths)
```

where `ldeaths` is the sum of `mdeaths` and `fdeaths`.