

Gregor de Cillia
Angelika Meraner
Statistics Austria

Toulouse, France
July, 2019

Persephone

Hierarchical Time Series in R

- **persephone** builds on top of **RJDemetra**
- the focus lies on hierarchical time series
 - visualization (interactive plots)
 - diagnostics
- only available on GitHub.
 - still under development: interfaces might change
 - CRAN release is planned for this year

```
remotes::install_github("statistikat/persephone")  
library(persephone)
```

persephone objects can be constructed from time series

```
class(AirPassengers)
```

```
## [1] "ts"
```

```
per_obj <- per_x13(AirPassengers)
```

Now, different methods can be called for the object per_obj.

```
per_obj$run()  
window(per_obj$adjusted, end = c(1950, 12))
```

| | | | | | | | |
|----|------|----------|----------|----------|----------|----------|----------|
| ## | | Jan | Feb | Mar | Apr | May | Jun |
| ## | 1949 | 123.7166 | 125.2532 | 125.9332 | 128.1540 | 129.0103 | 126.8570 |
| ## | 1950 | 128.1056 | 133.9933 | 133.2078 | 134.0477 | 134.2078 | 138.9436 |
| ## | | Jul | Aug | Sep | Oct | Nov | Dec |
| ## | 1949 | 123.9033 | 125.7702 | 127.0349 | 128.3796 | 128.5895 | 129.3838 |
| ## | 1950 | 142.6304 | 145.0065 | 146.9006 | 144.5718 | 140.6555 | 151.4765 |



Autocorrelations of the Residuals



SI Ratios and Seasonal Factors by Period



Normal Q-Q Plot



- hierarchical ts: time series that can be broken down into several components
- typical example: price indices
- tree-like structure



Several persephone objects can be combined to a hierarchical time series.

```
data(ipi_c_eu, package = "RJDemetra")
ht <- per_hts(
  NL = per_x13(ipi_c_eu[, "NL"]),
  FR = per_x13(ipi_c_eu[, "FR"]),
  IE = per_x13(ipi_c_eu[, "IT"])
)
ht$run(); ht
```

| ## | component | class | run | seasonality | log_transform |
|----|----------------|------------|--------|-------------|---------------|
| ## | | tramoseats | TRUE | Present | TRUE |
| ## | NL | x13Single | TRUE | Present | FALSE |
| ## | FR | x13Single | TRUE | Present | FALSE |
| ## | IE | x13Single | TRUE | Present | FALSE |
| ## | arima_md1 | n_outliers | q_stat | | |
| ## | (3 1 1)(0 1 1) | 1 | | NA | |
| ## | (0 1 1)(0 1 1) | 2 | | 0.2644848 | |
| ## | (0 1 1)(0 1 1) | 3 | | 0.2716330 | |
| ## | (3 1 1)(0 1 1) | 5 | | 0.2251183 | |

```
ht$run()  
plot(ht)
```



Further plans:

- Eurostat quality report
- dashboards
- methods for comparing direct and indirect adjustments
- hierarchical time series with dynamic weights

More information (including this presentation) can be found on GitHub pages.

- <https://statistikat.github.io/persephone/>

Thank you for your attention!