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# 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!