Package 'rucm'

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Type Package

Title Implementation of Unobserved Components Model (UCM)

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Description Unobserved Components Models (introduced in Harvey, A. (1989), Forecasting, structural time series models and the Kalman filter, Cambridge New York: Cambridge University Press) decomposes a time series into components such as trend, seasonal, cycle, and the regression effects due to predictor series which captures the salient features of the series to predict its behavior.

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Depends KFAS

VignetteBuilder knitr

Suggests knitr

BugReports https://github.com/kaushikrch/rucm/issues

RoxygenNote 5.0.0

NeedsCompilation no

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predict.ucm *Unobserved Components Model Predictions*

Description

Function `predict.ucm` predicts the future observations of an Unobserved Components Model. The `ucm` function returns an object `model` of class `SSModel` which is then further used in `predict.SSModel`.

Usage

```
## S3 method for class 'ucm'
predict(object, n.ahead, newdata, ...)
```

Arguments

`object`	an object of class `SSModel` which can be retrieved from `$model` call of an object of class `ucm`.
`n.ahead`	number of points for which forecasts are to generated.
`newdata`	dataset for which prediction is to be made.
`...`	ignored.

Value

A matrix or list of matrices containing the predictions.

See Also

`predict.SSModel`.

Examples

```
modelNile <- ucm(Nile~0, data = Nile, slope = TRUE)
predict(modelNile$model, n.ahead = 12)
```

print.ucm *Print ucm Object*

Description

Print ucm Object

Usage

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

Arguments

x	ucm object
...	Ignored.

---

rucm *rucm: Functions to model and predict a time series using Unobserved Components Model*

Description

Package rucm contains functions to model and predict a time series using Unobserved Components Model (UCM) (Harvey (1989)) which decomposes the series into its salient components of trend, seasons, cycles, and regression effects due to predictors.

Details

Unobserved Components Models (UCMs) are special cases of more general and powerful tool in time series called State Space Models having an observation equation, which relates the dependent series to an unobserved state vector, and a state equation describing the evolution of the state vector over time. For a detailed discussion on State Space Models refer Harvey (1989) or Helske (2014).

References

Harvey A. (1989). *Forecasting, structural time series models and the Kalman filter*. Cambridge New York: Cambridge University Press

Helske J (2014). **KFAS**: *Kalman filter and Smoothers for Exponential Family State Space Models*. R package version 1.0.4-1, URL http://CRAN.R-project.org/package=KFAS.

SAS Institute Inc (2010). *SAS/ETS 9.22 User's Guide*. SAS Institute Inc., Cary, NC. URL http://support.sas.com/documentation/cdl/en/etsug/60372/PDF/default/etsug.pdf.

Selukar R (2011). "State Space Modeling Using SAS". *Journal of Statistical Software*, **41**(12), 1-13. URL http://www.jstatsoft.org/v41/i12/.

Petris G, Petrone S (2011). "State Space Models in R". *Journal of Statistical Software*, **41**(4), 1-25. URL http://www.jstatsoft.org/v41/i04/.

Examples

```
modelNile <- ucm(Nile~0, data = Nile,
irregular = TRUE, level = TRUE, slope = TRUE)

modelNile #Print the model

#Return smoothed level values
modelNile$s.level

#Fixing the level variance to an absolute value
modelNile.fix <- ucm(Nile~0, data = Nile,
```

```
irregular = TRUE, level = TRUE, level.var = 500,
slope = TRUE)

#Predicting future values of the time series
predict(modelNile.fix, n.ahead = 12)
```

---

ucm *Unobserved components methods for a time series*

Description

Function ucm decomposes a time series into components such as trend, seasonal, cycle, and the regression effects due to predictor series using Unobserved Components Model (UCM).

Usage

```
ucm(formula, data, irregular = TRUE, irregular.var = NA, level = TRUE,
  level.var = NA, slope = FALSE, slope.var = NA, season = FALSE,
  season.length = NA, season.var = NA, cycle = FALSE, cycle.period = NA,
  cycle.var = NA)
```

Arguments

formula	an object of class formula containing the symbolic description of the model with dependent and independent terms. If there are no independent terms, replace rhs with 0.
data	a required data frame or list containing variables in the model.
irregular	logical; if irregular component is to be included in the model. Defaults to TRUE.
irregular.var	value to fix variance of irregular component.
level	logical; if level is to be included in the model. Defaults to TRUE.
level.var	value to fix variance of level component.
slope	logical; if slope is to be included in the model along with level. Defaults to FALSE.
slope.var	value to fix variance of the slope component.
season	logical; if seasonal component is to be included in the model. Defaults to FALSE.
season.length	value of length of seasonal component. Required when season is included.
season.var	value to fix variance of seasonal component.
cycle	logical; if cyclical component is to be included in the model. Defaults to FALSE.
cycle.period	length of cyclical component. Required when cycle is included.
cycle.var	value to fix variance of cyclical component.

Details

Formula of the model can be of the forma as in `lm` with response variable on rhs and predictor variables or 0 (if no predictor variables) on the rhs.

Value

object of class `ucm`, which is a list with the following components:

`est`	Estimates of predictor variables, if present.
`irr.var`	Estimated variance of irregular component, if present.
`est.var.level`	Estimated variance of the level component, if present.
`est.var.slope`	Estimated variance of slope of the level, if present.
`est.var.season`	Estimated variance of the seasonal component, if present.
`est.var.cycle`	Estimated variance of the cyclical component, if present.
`s.level`	An object of the same class as of dependent variable containing the time varying level values, if level is present.
`s.lope`	An object of the same class as of dependent variable containing the time varying slope values, if slope is present.
`s.season`	An object of the same class as of dependent variable containing the time varying seasonal values, if season is present.
`s.cycle`	An object of the same class as of dependent variable containing the time varying cyclical values, if cycle is present.
`vs.level`	A vector containing time varying estimated variance of level, if level is present.
`vs.slope`	A vector containing time varying estimated variance of slope, if slope is present.
`vs.season`	A vector containing time varying estimated variance of seasonal component, if season is present.
`vs.cycle`	A vector containing time varying estimated variance of cyclical component, if cycle is present.
`call`	Original call of the function.
`model`	The original model of class `SSModel` from `KFAS` package.

See Also

`KFAS`, `SSModel` for a detailed discussion on State Space Models.

Examples

```
modelNile <- ucm(Nile~0, data = Nile, slope = TRUE)
modelNile
modelNile$s.level
```

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