The ArDec Package

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Type Package

Title Time series autoregressive decomposition

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Description Package ArDec implements the autoregressive decomposition of a time series based on the constructive approach in West (1997). Particular cases include the extraction of trend and seasonal components from a monthly time series. Uncertainty on the resulting components can be derived from sampling of the autoregressive model which is written as a linear regression model and handled on a Bayesian framework.

R topics documented:

`ardec` *Time series autoregressive decomposition*

Description

Decomposition of a time series into latent subseries from a fitted autoregressive model

Usage

```
ardec(x, coef, ...)
```

Arguments

`x`	time series
`coef`	autoregressive parameters of AR(p) model
`...`	additional arguments for specific methods

Details

If an observed time series can be adequately described by an (eventually high order) autoregressive AR(p) process, a constructive result (West, 1997) yields a time series decomposition in terms of latent components following either AR(1) or AR(2) processes depending on the eigenvalues of the state evolution matrix.

Complex eigenvalues r exp(iw) correspond to pseudo-periodic oscillations as a damped sine wave with fixed period (2pi/w) and damping factor r. Real eigenvalues correspond to a first order autoregressive process with parameter r.

Value

A list with components:

`period`	periods of latent components
`modulus`	damping factors of latent components
`comps`	matrix of latent components

Author(s)

S. M. Barbosa

References

West, M. (1997), Time series decomposition. Biometrika, 84, 489-494.

West, M. and Harrisson, P.J. (1997), Bayesian Forecasting and Dynamic Models, Springer-Verlag.

Examples

```
data(tempEng)
coef=ardec.lm(tempEng)$coefficients
decomposition=ardec(tempEng,coef)
```

`ardec.components` *Autoregressive components*

Description

Extraction of autoregressive components from object of class "ardec"

Usage

```
ardec.components(object, ...)
```

Arguments

`object`	object of class "ardec"
`...`	additional arguments for specific methods

Value

A list with components

`periodcomps`	periodic autoregressive components
`trendcomp`	trend component

Author(s)

S. M. Barbosa

Examples

```
data(tempEng)
dec=ardec(tempEng,ardec.lm(tempEng)$coefficients)
comps=ardec.components(dec)
plot(comps$trendcomp)
plot(comps$periodcomps$comps)
```

`ardec.lm` *Fit an autoregressive model as a linear regression*

Description

Function ardec.lm fits an autoregressive model of order p, AR(p) to a time series through a linear least squares regression.

Function ardec.lm.bayes provides a sample of autoregressive parameters from the multivariate normal posterior distribution for the coefficients assuming a (non-informative) reference prior.

Usage

```
ardec.lm(x)

ardec.lm.bayes(x,R,med=TRUE)
```

Arguments

`x`	time series
`R`	size of sample to be simulated from posterior
`med`	logical, indicating if a median vector of autoregressive parameters should be computed from the simulated sample

Value

For ardec.lm, an object of class "lm".

For ardec.lm.bayes an Rxp matrix containing the samples of autoregressive coefficients as columns (if med=FALSE).

If med=TRUE, ardec.lm.bayes returns a single column matrix containing the median vector of autoregressive parameters.

Author(s)

S. M. Barbosa

References

West, M. (1995), Bayesian inference in cyclical component dynamic linear models.Journal of the American Statistical Association, 90, 1301-1312.

See Also

`ar`, `lm`

Examples

```
data(tempEng)
model=ardec.lm(tempEng)
```

`ardec.sampling` *Auxiliary function*

Description

Auxiliary function: sampling from a linear model posterior distribution assuming a reference (non-informative) prior

Usage

```
ardec.sampling(x, fit)
```

Arguments

`x`	time series
`fit`	object of class "lm" from a linear regression fit

Value

`ARcoef`	vector of autoregressive parameters sampled from the posterior distribution

Author(s)

S. M. Barbosa

Examples

```
data(tempEng)
model=ardec.lm(tempEng)
ardec.sampling(tempEng,model)
```

tempEng	*Time series of monthly temperature values*

Description

Monthly temperature in Central England from 1723-1970

Usage

```
data(tempEng)
```

Format

Time-Series [1:2976] from 1723 to 1971

Source

Hipel, K. W. and Mcleod, A. (1994) Time Series Modelling of Water Resources and Environmental Systems, Elsevier

Examples

```
data(tempEng)
```

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