

Package ‘ArDec’

January 20, 2025

Version 2.1-1

License GPL (>= 2)

Title Time Series Autoregressive-Based Decomposition

Description Autoregressive-based decomposition of a time series based on the approach in West (1997). Particular cases include the extraction of trend and seasonal components.

Author Susana Barbosa

Maintainer Susana Barbosa <sabarbosa@fc.ul.pt>

Date 2022-05-31

NeedsCompilation no

Repository CRAN

Date/Publication 2022-05-31 22:20:26 UTC

Contents

ardec	1
ardec.lm	3
ardec.periodic	4
ardec.trend	5
tempEng	5

Index	7
--------------	----------

ardec	<i>Time series autoregressive decomposition</i>
-------	---

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 $(2\pi/w)$ 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 Harrison, P.J. (1997), *Bayesian Forecasting and Dynamic Models*, Springer-Verlag.

Examples

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

# warning: running the next command can be time consuming!

decomposition=ardec(tempEng,coef)
```

`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.

Usage

```
ardec.lm(x)
```

Arguments

`x` time series

Value

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

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.periodic	<i>Extraction of individual periodic components from a monthly time series</i>
----------------	--

Description

Function `ardec.periodic` extracts a periodic component from the autoregressive decomposition of a monthly time series.

Usage

```
ardec.periodic(x, per, tol = 0.95)
```

Arguments

<code>x</code>	time series
<code>per</code>	period of the component to be extracted
<code>tol</code>	tolerance for the period of the component

Value

A list with components:

<code>period</code>	period for the annual component
<code>modulus</code>	damping factor for the annual component
<code>component</code>	extracted component

Author(s)

S. M. Barbosa

Examples

```
data(tempEng)
ardec.periodic(tempEng, per=12)
```

`ardec.trend`*Estimation of the trend component from a monthly time series*

Description

Function `ardec.trend` extracts the trend component from the autoregressive decomposition of a monthly time series.

Usage

```
ardec.trend(x)
```

Arguments

`x` time series

Value

A list with components:

`modulus` damping factor for the annual component

`trend` trend component

Author(s)

S. M. Barbosa

Examples

```
data(co2)
ardec.trend(co2)
```

`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)
```

Index

* **datasets**

tempEng, 5

* **ts**

ardec, 1

ardec.lm, 3

ardec.periodic, 4

ardec.trend, 5

ar, 3

ardec, 1

ardec.lm, 3

ardec.periodic, 4

ardec.trend, 5

lm, 3

tempEng, 5