

# Package ‘ArDec’

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**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.

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ardec	<i>Time series autoregressive decomposition</i>
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## 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)
```

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`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)
```

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

x	time series
per	period of the component to be extracted
tol	tolerance for the period of the component

**Value**

A list with components:

period	period for the annual component
modulus	damping factor for the annual component
component	extracted component

**Author(s)**

S. M. Barbosa

**Examples**

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

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ardec.trend	<i>Estimation of the trend component from a monthly time series</i>
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**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
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**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)
```

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tempEng

*Time series of monthly temperature values*

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**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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