

Package: descomponer (via r-universe)

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Description Decompose a time series into seasonal, trend and irregular components using transformations to amplitude-frequency domain.

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cdf	<i>Get Auxiliary Matrix</i>
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Description

Gets the auxiliary matrix to vector in time domain, pre-multiplies the vector by the orthogonal matrix, W , and its transpose, Parra F. (2013)

Usage

```
cdf(y)
```

Arguments

`y` a vector of the observed time-serie values

Value

a matrix of sine and cosine waves adjusted to time-serie

Author(s)

Francisco Parra

References

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, International Economic Review, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Examples

```
n<-100;x<-seq(0,24*pi,length=n);y<-sin(x)+rnorm(n,sd=.3)
cdf(y)
```

celec	<i>Consumption of electricity in Spain</i>
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Description

A vector: celec, Miles de Tep, 1995 a 2013

Usage

```
data(celec)
```

Source

Instituto Nacional de Estadística Spain

descomponer	<i>Time series decomposition</i>
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Description

Decompose a time series into seasonal, trend and irregular components using the transform amplitude-frequency domain to time series.

Usage

```
descomponer(y, frequency, type)
```

Arguments

y	a Vector of the observed time-serie values
frequency	Number of times in each unit time interval
type	lineal (1), quadratic(2)

Details

One could use a value of 7 for frequency when the data are sampled daily, and the natural time period is a week, or 4 and 12 when the data are sampled quarterly and monthly and the natural time period is a year.

Transforms the time series in amplitude-frequency domain, by a band spectrum regression (Parra, F., 2013) of the serie y_t and a OLS lineal trend, in which regression is carried out in the low and the seasonal amplitude-frequency domain. The low frequency are the periodicity $n/2 * frequency$ or $(n-1)/2 * frequency$, if n is odd. The seasonal frequency are the periodicity: $2n/2 * frequency, 3n/2 * frequency, 4n/2 * frequency, \dots$

Use the "sort.data.frame" function, Kevin Wright (<http://tolstoy.newcastle.edu.au/R/help/04/07/1076.html>).

Slow computer in time series higher 1000 data.

The output is a data.frame object.

Value

y	The Vector of the observed time-series values
TDST	The trend and seasonal time serie of y
TD	The trend time serie of y
ST	The seasonal time serie of y
IR	The remainder time serie of y
regresoresTD	The regressors matrix use to the trend estimated
regresoresST	The regressors matrix use to the seasonal estimated
coeficientesTD	The coefficient vector use to the trend estimated
coeficientesSD	The coefficient vector use to the seasonal estimated

References

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, International Economic Review, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Examples

```
data(ipi)
datos <- descomponer(ipi,12,2)
plot(ts(datos$datos, frequency=12))
```

 estimardf

Prediction whit Regression in domain frequency

Description

Make a prediction for a rdf object

Usage

```
estimardf(a,b)
```

Arguments

a	a model rdf
b	An optional data frame in which to look for variables with which to predict. If omitted, the fitted values are used.

Details

Use predict.lm, with interval="prediction"

Slow computer in time series higher 1000 data.

Value

fit vector or matrix as above

References

DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram of Least-Squares Residuals," *Biometrika*, 56, (No. 1, 1969), 1-15.

Engle, Robert F. (1974), Band Spectrum Regression, *International Economic Review* 15,1-11.

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Examples

```
data(PIB)
data(celec)
mod1=rdf(celec,PIB)
newdata=c(20000)
estimardf(mod1,newdata)
```

FFF

Regression in Fourier Flexible Form

Description

Make a Fourier Flexible Form Regression

Usage

```
FFF(y, x)
```

Arguments

y a Vector of the dependent variable
x a Vector of the independent variable

Details

The regression FFF use LM for fitted into the serie y_t and the fourier coefficients expansion described in Gallant (1984).

The output is a data.frame object.

Value

fitted	The time - serie fitted
X	The X time - series fourier coefficients
residuals	The time - serie fitted

References

DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram of Least-Squares Residuals," *Biometrika*, 56, (No. 1, 1969), 1-15.

Engle, Robert F. (1974), Band Spectrum Regression, *International Economic Review* 15,1-11.

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.

Gallant; A. R.(1984), The Fourier Flexible Form. *Amer. J. Agr. Econ.*66(1984):204-15.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Parra, F.(2021), Econometria con Series de Fourier (<https://econometria.files.wordpress.com/2020/12/curso-de-econometria-avanzado.pdf>)

Examples

```
data(PIB)
data(celec)
FFF(celec,PIB)
```

gdescomponer

Plotting the trend and seasonal

Description

Plotting the trend and seasonal of time series.

Usage

```
gdescomponer(y, freq, type, year, q)
```

Arguments

y	a vector of the observed time-serie values
freq	Number of times in each unit time interval
type	lineal (1), quadratic(2)
year	the year of the first observation
q	the time of the first observation

References

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[descomponer](#)

Examples

```
data(ipi)
gdescomponer(ipi, 12, 1, 2002, 1)
```

gdf

Get Frequency Data

Description

Transforms the data from the amplitude-time domain the amplitude-frequency domain pre-multiplied by the orthogonal matrix W , whose elements are defined in Harvey A.C. (1978).

Usage

```
gdf(y)
```

Arguments

`y` a vector of the observed time-series values

Value

a vector of the estimated coefficients fourier

Author(s)

Francisco Parra

References

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, International Economic Review, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[gdt](#)

Examples

```
n<-100;x<-seq(0,24*pi,length=n);y<-sin(x)+rnorm(n,sd=.3)
gdf(y)
```

gdt

Get Time Data

Description

Transforms the data from the amplitude-frequency domain the amplitude-time domain pre-multiplied by inverse of the orthogonal matrix W , whose elements are defined in Harvey A.C. (1978).

Usage

```
gdt(y)
```

Arguments

`y` a vector of the coefficients fourier

Value

a vector of the observed time-series values

Author(s)

Francisco Parra

References

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, International Economic Review, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[gdf](#)

Examples

```
n<-100;x<-seq(0,24*pi,length=n);y<-sin(x)+rnorm(n,sd=.3)
coef <- gdf(y)
gdt(coef)
```

`gperiodograma`*Plotting method for specturm*

Description

Plotting method for specturm calculate by periodograma function.

Usage

```
gperiodograma(y)
```

Arguments

`y` a vector of the observed time-serie values

References

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[periodograma](#)

Examples

```
n<-100;x<-seq(0,24*pi,length=n);y<-sin(x)+rnorm(n,sd=.3)
gperiodograma(y)
```

`gtd`*Plotting method for specturm*

Description

Plotting cumulative periodogram test.

Usage

```
gtd(y)
```

Arguments

`y` a vector of the observed time-serie values

References

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[td](#)

Examples

```
data(PIB)
gtd(PIB)
```

ipi

Indice de Produccion Industrial de Cantabria

Description

A vector: IPI, Base: 2010. Enero 2002 a Abril 2014

Usage

```
data(ipi)
```

Source

Instituto Nacional de Estadistica Spain

MW

Get Frequency Data

Description

Orthogonal matrix defined in Harvey (1978)

Usage

```
MW(n)
```

Arguments

n rows and columns number

Value

Orthogonal matrix of n X n dimensions

Author(s)

Francisco Parra

References

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.

See Also

[gdt](#), [gdf](#), [cdf](#)

Examples

MW(80)

 periodograma

Periodogram

Description

Calculates and displays the spectrum of the time serie

Usage

periodograma(y)

Arguments

y a vector of the observed time-serie values

Value

frecuencia	Vector of frequencies at which the spectral density is estimated. The units are the reciprocal of cycles per unit time.
omega	Is calculated by $\pi * \text{frecuencia} / (n/2)$
periodos	$n / \text{frecuencia}$
densidad	Vector of estimates of the spectral density at frequencies corresponding to frecuencia.

References

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[gperiodograma](#)

Examples

```
n<-100;x<-seq(0,24*pi,length=n);y<-sin(x)+rnorm(n,sd=.3)
periodograma(y)
```

PIB	<i>GDP Volume Index in Spain</i>
-----	----------------------------------

Description

A vector: PIB, Base: 2010. 1995 a 2013

Usage

```
data(PIB)
```

Source

Instituto Nacional de Estadistica Spain

predictFFF	<i>Prediction whit Regression in FFF</i>
------------	--

Description

Make a prediction for a rdf object

Usage

```
predictFFF(y,x,new)
```

Arguments

y	a Vector of the dependent variable
x	a Vector of the independent variable
new	A data frame in which to look for variables with which to predict. If omitted, the fitted values are used.

Details

Use predict.lm, with interval="confidence"

Value

fit	vector or matrix as above
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References

- DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram of Least-Squares Residuals," *Biometrika*, 56, (No. 1, 1969), 1-15.
- Engle, Robert F. (1974), Band Spectrum Regression, *International Economic Review* 15, 1-11.
- Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.
- Gallant; A. R. (1984), The Fourier Flexible Form. *Amer. J. Agr. Econ.* 66(1984):204-15.
- Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)
- Parra, F. (2021), *Econometria con Series de Fourier* (<https://econometria.files.wordpress.com/2020/12/curso-de-econometria-avanzado.pdf>)

Examples

```
data("ipi")
t=seq(1:length(ipi))
Mod1=FFF(ipi, t)
plot(ipi)
lines(Mod1$fitted)
new=(length(t)+1):(length(t)+12)
Mod2=predictFFF(ipi, t, new)
```

predictrdf

Prediction whit Regression in domain frequency

Description

Make a prediction for a rdf object

Usage

```
predictrdf(a,b)
```

Arguments

- | | |
|---|--|
| a | a model rdf |
| b | An optional data frame in which to look for variables with which to predict. If omitted, the fitted values are used. |

Details

- Use `predict.lm`, with `interval="prediction"`
- Slow computer in time series higher 1000 data.

Value

fit vector or matrix as above

References

DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram of Least-Squares Residuals," *Biometrika*, 56, (No. 1, 1969), 1-15.

Engle, Robert F. (1974), Band Spectrum Regression, *International Economic Review* 15, 1-11.

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Examples

```
data(PIB)
data(celec)
mod1=rdf(celec,PIB)
newdata=c(100)
predictrdf(mod1,newdata)
```

 rdf

Regression in domain frequency

Description

Make a Band Spectrum Regression using the comun frequencies in cross-spectrum .

Usage

```
rdf(y,x)
```

Arguments

y a Vector of the dependent variable
 x a Vector of the independent variable

Details

Transforms the time series in amplitude-frequency domain, order the fourier coefficient by the comun frequencies in cross-spectrum, make a band spectrum regresion (Parra, F. ,2013) of the serie y_t and x_t for every set of fourier coefficients, and select the model to pass the Durbin test in the significance chosen.

If not find significance for Band Spectrum Regression, make a OLS.

The generalized cross validation (gcv), is calculated by: $gcv = n * sse / ((n-k)^2)$

where "sse" is the residual sums of squares, "n" the observation, and k the coefficients used in the band spectrum regression.

Slow computer in time series higher 1000 data.

The output is a data.frame object.

Value

datos\$Y	The Y time-serie
datos\$X	The X time-serie
datos\$F	The time - serie fitted
datos\$reg	The error time-serie
Fregresores	The matrix of regressors choosen in frequency domain
Tregresores	The matrix of regressors choosen in time domain
Nregresores	The coefficient number of fourier chosen
sse	Residual sums of squares
gcv	Generalized Cross Validation

References

DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram of Least-Squares Residuals," *Biometrika*, 56, (No. 1, 1969), 1-15.

Engle, Robert F. (1974), Band Spectrum Regression, *International Economic Review* 15,1-11.

Harvey, A.C. (1978), Linear Regression in the Frequency Domain, *International Economic Review*, 19, 507-512.

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

Examples

```
data(PIB)
data(celec)
rdf(celec,PIB)
```

td	<i>Cumulative periodogram test</i>
----	------------------------------------

Description

Cumulative periodogram test.

Usage

```
td(y)
```

Arguments

`y` a vector of the observed time-serie values

Details

The output is a `data.frame` object.

Value

<code>s2</code>	Cumulative periodogram.
<code>min</code>	Is calculated by $-c+(t/\text{length}(y))$
<code>max</code>	Is calculated by $c+(t/\text{length}(y))$

References

Parra, F. (2014), Amplitude time-frequency regression, (<http://econometria.wordpress.com/2013/08/21/estimation-of-time-varying-regression-coefficients/>)

See Also

[periodograma](#)

Examples

```
data(PIB)
td(PIB)
```


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