Package 'descomponer'

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Title Seasonal Adjustment by Frequency Analysis

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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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R topics documented:

`cdf` *Get Auxiliary Matrix*

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 *Consumption of electricity in Spain*

Description

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

Usage

```
data(celec)
```

Source

Instituto Nacional de Estadistica Spain

descomponer *Time series decomposition*

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 regresion (Parra, F. ,2013) of the serie y_t and a OLS lineal trend, in which regression is carried out in the low and the sesaonal amplitude-frequency_t .The low frequency are the periodicity a 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,.. .

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-serievalues
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 ofLeast-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 regresion 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 ofLeast-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 columuns 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*frecuencia/(n/2)
periodos	n/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 *GDP Volume Index in Spain*

Description

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

Usage

```
data(PIB)
```

Source

Instituto Nacional de Estadistica Spain

---

predictFFF *Prediction whit Regression in FFF*

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

References

DURBIN, J., "Tests for Serial Correlation in Regression Analysis based on the Periodogram ofLeast-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 ofLeast-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 caluculated 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 ofLeast-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 *Cumulative periodogram test*

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

s2	Cumulative periodogram.
min	Is calculated by -c+(t/length(y))
max	Is calculated by c+(t/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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