outorg-edit-buffer

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June 17, 2013

Contents

1 ardec

1.1 meta

1.2 man

1.2.1 Description

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

1.2.2 Usage

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

1.2.3 Arguments

x time series

coef autoregressive parameters of AR(p) modebl

... additional arguments for specific methods

1.2.4 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.

1.2.5 Value

A list with components:

period periods of latent components

modulus damping factors of latent components

comps matrix of latent components

1.2.6 References

[West, 1997]
[West and Harrison, 1997]

1.2.7 Examples

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

warning: running the next command can be time comsuming!

```
decomposition=ardec(tempEng,coef)
```

1.3 R

```
ardec <- function(x,coef, ...) {

  dat=x-mean(x)
  p=length(coef)
  ndat=length(x)

  G=matrix(nrow=p,ncol=p)

  G[1,]=coef
  G[seq(2,p),seq(1,p-1)]=diag(1,(p-1))
  G[seq(2,p),p]=0

  modulus=Mod(eigen(G)[[1]])
  lambda=2*pi/Arg(eigen(G)[[1]])

  eigenvalues=eigen(G)
  A=diag(eigenvalues[[1]])
  E=eigenvalues[[2]]
  B=solve(E)
  F=rep(NA,p)
  F[1]=1
  F[seq(2,p)]=0
  a=t(E) %*% F
  d=diag(as.vector(a))
  H=d %*% B
```

```
    Z=matrix(nrow=p,ncol=ndat)
    Z[1,]=dat
    for (i in seq(1,p-1)){
        Z[i+1,]=as.vector(filter(dat,c(rep(0,i),1), method="convolution",
        sides=1))}

    g=matrix(nrow=p,ncol=ndat)
    for (j in seq(1,p)){
        for (t in seq(1,ndat)){
            g[j,t]=H[j, ] %*% Z[,t] }}


    return(list(period=lambda,modulus=modulus,comps=g))
}
```

1.4 data

2 ardec.lm

2.1 meta

2.2 man

2.2.1 Description

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

2.2.2 Usage

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

2.2.3 Arguments

```
\item{x}{time series}

# \item{R}{size of sample to be simulated from posterior}

# \item{med}{logical, indicating if a median vector of autoregressive parameters
# should be computed from the simulated sample}
```

2.2.4 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.
```

2.2.5 References

[West, 1995]

2.2.6 Examples

2.3 R

```r
ardec.lm <- function(x) {

    require(stats)

    dat=x-mean(x)
    ndat=length(dat)
    ## p=order of autoregressive model from AIC (burg method)
    p=ar(dat,method="burg")[[1]]
    ## linear autoregressive model fit
    X=t(matrix(dat[rev(rep((1:p),ndat-p)+
    rep((0:(ndat-p-1)),rep(p,ndat-p)))],p,ndat-p))
    y=rev(dat[(p+1):ndat])
    fit=lm(y~-1+X, x=TRUE)

    return(fit)
}
```

3 ardec.periodic

3.1 meta

3.2 man

3.2.1 Description

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

3.2.2 Usage

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

3.2.3 Arguments

3.2.4 Details

3.2.5 Value

3.2.6 References

3.2.7 Examples

3.3 R

```
ardec.periodic <- function(x,per,tol=0.95){

    ## if(frequency(x)!=12){stop("monthly time series required")}
    ## updated 29 Apr 2013

    fit=ardec.lm(x)

    comp=ardec(x,fit$coefficients)

    if(any(comp$period > (per-tol) & comp$period < (per+tol))) {
        candidates=which(comp$period > (per-tol) & comp$period < (per+tol))
        lper=candidates[which.max(comp$modulus[candidates])]
        l=comp$period[lper]
        m=comp$modulus[lper]
        gt=Re(comp$comps[lper,]+comp$comps[lper+1,])    }

    return(list(period=l,modulus=m,component=gt))
```

}

4 ardec.trend

4.1 meta

4.2 man

4.2.1 Description

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

4.2.2 Usage

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

4.2.3 Arguments

4.2.4 Details

4.2.5 Value

4.2.6 References

4.2.7 Examples

4.3 R

```
ardec.trend <- function(x){

    options(warn=-1)

    fit=ardec.lm(x)


    comp=ardec(x, fit$coefficients)

    if(any(comp$period==Inf)){warning("no trend component")}


    if(any(comp$period ==Inf)){
        l=comp$period[which(match(comp$period, Inf)==1)[1]]
```

```
        m=comp$modulus[which(match(comp$period,Inf)==1)[1]]
        gt=Re(comp$comps[which(match(comp$period,Inf)==1 )[1],])

    }

    return(list(modulus=m, trend=gt))

}
```

5 tempEng

5.1 meta

5.2 man

5.2.1 Description

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

5.2.2 Usage

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

5.2.3 Arguments

5.2.4 Details

5.2.5 Value

5.2.6 References

5.2.7 Examples

5.3 R

References

[West, 1995] West, M. (1995). Bayesian inference in cyclical component dynamic linear models. *Journal of the American Statistical Association*, 90(432):1301–1312.

[West, 1997] West, M. (1997). Time series decomposition. *Biometrika*, 84(2):489–494.

[West and Harrison, 1997] West, M. and Harrison, J. (1997). Bayesian forecasting and dynamic models (springer series in statistics).