Package 'HBSTM'

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Type Package

Title Hierarchical Bayesian Space-Time Models for Gaussian Space-Time Data

Version 1.0.2

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Description Fits Hierarchical Bayesian space-Time models for Gaussian data. Furthermore, its functions have been implemented for analysing the fitting qualities of those models.

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Depends methods, MASS, fBasics, maps, stats, graphics,grDevices,utils

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`HBSTM-package` *Hierarchical Bayesian Space-Time models for Gaussian space-time data*

Description

This package fits Hierarchical Bayesian space-Time models for Gaussian data. Furthermore, its functions have been implemented for analysing the fitting qualities of those models.

Details

Package:	HBSTM
Type:	Package
Version:	1.0
Date:	2013-12-24
License:	GPL (>=2.0)
Depends:	methods, MASS, msm, fBasics, maps

Author(s)

Pilar Munyoz and Alberto Lopez Moreno Maintainer: Alberto Lopez Moreno <bertolomo@gmail.com>

See Also

Overview: `HBSTM-package`
Classes : `HBSTM`,`Parameters`,`Mu`,`Mt`,`Xt`,`Autoregressive`,`Seas`,`SpatParam`,`VectSubdiag`,`Hyperpriors`,`Mu0`,`Mt0`,`Xt0`,
Methods : `hbstm`,`hbstm.fit`,`results`,`estimation`,`resid`,`mse`
Plot : `plotRes`,`plotFit`

Data: hirlam,coordinates

Autoregressive-class *Class* "Autoregressive"

Description

"Autoregressive" contains the parameter values of the autoregressive component, and it is an internal class stored in the class "Xt".

Slots

avect: An Sx1 "matrix" (S is the number of spatial points on the predicted grid) containing the temporal autoregressive parameter avect

a0vect: An Sx1 "matrix" containing the temporal autoregressive parameter a0vect

a0L: A 3x1 "matrix" containing the temporal autoregressive parameter a0L

spatialA: An object of class "SpatParam" containing the fitted values of the spatial parameters of avect.

sigma2A: Contains the fitted value of the variance sigma2A.

H: An SxS "matrix" containing all the autoregressive space-time parameters.

subdiag: An object of class "VectSubdiag" containing the fitted values of the space-time parameters.

Methods

[signature(x = "Autoregressive", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Autoregressive", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

`Autoregressive0-class` *Class* `"Autoregressive0"`

Description

`"Autoregressive0"` contains the hyperprior values of the autoregressive component, and it is an internal class stored in the class `"Xt0"`.

Slots

`a0L0`: A `"vector"` of length 3 with the mean hyperprior values of the parameter `a0L`.

`siga0L0`: A `"matrix"` of dimension 3X3 with the hyperprior variance of the parameter `a0L`.

`sigma2A0`: A `"vector"` of length 2 with the hyperprior values of the parameter `sigma2A`.

`spatialA0`: An object of class `"SpatParam0"` containing the hyperprior values of the spatial parameters of `avector`

`subdiag0`: An object of class `"VectSubdiag0"` containing the hyperprior values of the spatial-temporal parameters.

Methods

`[` `signature(x = "Autoregressive0", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

`[<-` `signature(x = "Autoregressive0", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

coordinates *Coordinates of the dataset "hirlam"*

Description

The coordinates data is a data set that contains the spatial coordinates of the space-time data hirlam.

Format

A data frame with 70 observations on the following 2 variables.

Longitude the longitude coordinates.

Latitude the latitude coordinates.

estimation *Estimation of the median parameters*

Description

Estimates the median parameters of an object of class HBSTM.

Usage

```
estimation(object,digits)
```

Arguments

object	an object of class "HBSTM".
digits	integer indicating the number of decimal places to round the median values.

Details

In caste the MCMC samples of the object parameter are a specific component of the model, the others components have value -9999999.

Value

Returns an object of class Parameters with the median estimation of the parameters MCMC samples.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

---

hbstm *Fitting Hierarchical Bayesian Space Time models*

Description

hbstm is used to fit Hierarchical Bayesian Space Time models.

Usage

```
hbstm(Zt,K,newGrid,reglag,seas,spatlags,hyperpriors,initialvalues,
nIter,nBurn,fit,plots,posterior,save,control)
```

Arguments

Zt	: MxT "data.frame" containing the data. The rows contains the "M" spatial points and the columns the "T" temporal observations.
K	: MxS "matrix" that relates the observed spatial points with the new Grid. S is the number of predicted spatial points.
newGrid	An Sx2 "data.frame" containing the "Longitude" and the "Latitude" of the new Grid.
reglag	A vector containing the temporal autoregressive lags of the model.
seas	A vector containing the seasonal coefficients of the model.
spatlags	A vector of length 4 containing the spatial lags of the model. See details for more information.
hyperpriors	An object of class Hyperpriors containing all the values of the model hyperpriors.
initialvalues	An object of class Parameters containing all the initial values of the model parameters.
nIter	Number of Gibbs Sampling iterations. Default value is 1000.
nBurn	Number of burn-in samples. This number of samples will be discarded before making any inference. Default value is the 20 percent of nIter.
fit	A "logical" indicating whether the HBSTM is fitted.

plots	A "logical" indicating whether the method shows the plots of the execution (The mse, Zt vs X*Yt and the ACF/PACF of the residuals.
posterior	A "character" indicating whether the function returns the 'mean' and 'sd' the fitted values of Yt or returns the 'median' with its 95 percent credibility intervals.
save	A "character" indicating if, for each iteration, the algorithm saves the estimation of certain parameters. See "Details"s for more information.
control	a list of control parameters. See "Details".

Details

Each position of the argument spatlags refers to the spatial lags of a specified direction. These four directions are "east-west", "north-south", "northwest-southeast" and "northeast-southwest".

The save argument is a "character" that can have any of the following options:

-"all": Save an object of class Parameters.

-"Mu": Save an object of class Mu.

-"Mt": Save an object of class Mt.

-"Xt": Save an object of class Xt.

The control argument is a list that can supply any of the following components:

-time: A "logical" indicating whether the method shows the estimated time of execution.

-timerem: A "logical" indicating whether the method shows the estimated remaining time of execution

-seed: The seed to use in the function "set.seed" and set it to fit the model.

Value

hbstm returns an object of class HBSTM

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

HBSTM-class *Class* "HBSTM"

Description

"HBSTM" contains all the information of the fitted Hierarchical Bayesian Space-Time model.

Slots

Parameters: An object of "Parameters" containing all the parameters of the fitted model.

Hyperpriors: An object of class "Hyperpriors" containing all the hyperpiors used in the fitted model.

seed: The seed used to fit the model.

mse: A vector containing the MSE of each iteration of the algorithm.

iterations: The total number of iterations that the algorithm has executed.

newGrid: An Sx2 "matrix" (S is the number of spatial points of the predicted grid) containing the Longitude (1rst col.) and the Latitudes (2nd col.) of the new grid.

K: An MxS "matrix" (M = observed spatial points) that relates the observations to the new grid.

Zt: A MxT "matrix" (T is the temporal points) containing the data.

fitted: An "array" which contains the estimation of the fitted values of 'Yt'. The dimension of the array is SxTx2 when the algorithm estimates the mean and the standard deviation and is SxTx3 when the algorithm estimates the median and its 95 percent credibility intervals.

residuals: A MxT "matrix" with the obtained model residuals.

MCMCsamp: A "list" of length: the number of executed iterations containing the MCMC samples of the objects of class "Parameters", "Mu", "Mt" or "Xt", for each iteration.

MCMCclass: A "character" that specifies which type of object is stored in MCMCsamp. The options are "Parameters", "Mu", "Mt" or "Xt"

Methods

[signature(x = "HBSTM", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "HBSTM", i = "character", j = "missing"): assign values to the components of the model.

hbstm.fit signature(HBSTM = "HBSTM", niter = "numeric"): ...

hbstm.save signature(HBSTM = "HBSTM", name = "character"): ...

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

---

hbstm.fit *Fitted function for Hierarchical Bayesian Space Time models*

Description

This is the basic computing engine that hbstm uses to fit Hierarchical Bayesian Space Time models. In general, this should not be used directly, unless by experienced users.

Usage

```
hbstm.fit(HBSTM,nIter,nBurn,time,timerem,plots,posterior,save)
```

Arguments

HBSTM	An object of class "HBSTM".
nIter	Number of Gibbs Sampling iterations. Default value is 1000.
nBurn	Number of burn-in samples. This number of samples will be discarded before making any inference. Default value is the 20 percent of nIter.
time	A "logical" indicating whether the method shows the estimated time of execution.
timerem	A "logical" indicating whether the method shows the estimated remaining time of execution.
plots	A "logical" indicating whether the method shows the plots of the execution (the mse, Zt vs K*Yt and the ACF/PACF of the residuals.
posterior	A "character" indicating whether the function returns the mean and the standard deviation of the fitted values of Yt or returns the median with its 95 percent credibility intervals.
save	A "character" indicating if, for each iteration, the algorithm save the estimation of certain parameters. See "Details" for more information.

Details

The save argument is a "character" that can have any of the following options:

-"all": Save an object of class Parameters.

-"Mu": Save an object of class Mu.

-"Mt": Save an object of class Mt.

-"Xt": Save an object of class Xt.

Value

`hbstm.fit` returns an object of class HBSTM

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

`hirlam` *hirlam*

Description

The data store the temperature, which is collected in a grid of 70 points (n=7 x m=10 points in the grid) in the area that extends from 4 degrees 30" W to 6 degrees 30"W longitude, and from 35 degrees 3"N to 36 degrees 5"N.

The analysed period covers January 1st 2009 to December 31st 2010; the frequency of the data is every 3 hours (temporal reference system is UTC); it starts at 00:00 (daily analysis) and forecasting is at 3:00, 6:00, 9:00, 12:00, 15:00, 18:00 and 21:00. The temperature is recorded every day, eight times a day; so we have a time series for each variable: one for each point on the grid with 5824 time observations.

Format

A data frame with 70 x 5824 observations.

- The rows represent the spatial points ordered from up to down and left to right in the `hirlam`) coordinates.
- The columns represent the time observations.

`Hyperpriors-class` *Class* `"Hyperpriors"`

Description

`"Hyperpriors"` contains all the hyperpriors of the fitted HBSTM. It is an internal class and is stored in `"HBSTM"`

Slots

`Mu0`**:** An object of class `"Mu0"` containing all the hyperpriors of the component `"Mu"`.

`Mt0`**:** An object of class `"Mt0"` containing all the hyperpriors of the component `"Mt"`.

`Xt0`**:** An object of class `"Xt0"` containing all the hyperpriors of the component `"Xt"`.

`sigma2Y0`**:** A `"vector"` of length 2 with the hyperprior values of the parameter `sigma2Y`.

`sigma2E0`**:** A `"vector"` of length 2 with the hyperprior values of the parameter `sigma2E`.

Methods

[`signature(x = "Hyperpriors", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "Hyperpriors", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: `HBSTM-package`
Classes : `HBSTM`,`Parameters`,`Mu`,`Mt`,`Xt`,`Autoregressive`,`Seas`,`SpatParam`,`VectSubdiag`,`Hyperpriors`,`Mu0`,`Mt0`,`Xt0`,
Methods : `hbstm`,`hbstm.fit`,`results`,`estimation`,`resid`,`mse`
Plot : `plotRes`,`plotFit`
Data: `hirlam`,`coordinates`

mse *Mean Square Error*

Description

Calculate the mean square error of an object of class HBSTM.

Usage

```
mse(object)
```

Arguments

object	An object of class "HBSTM".

Value

Returns a "numeric" with the mean square error value.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Mt-class *Class "Mt"*

Description

"Mt" contains the parameter values of the seasonal component and is an internal class stored in "Parameters".

Slots

Mt: A "matrix" of dimension SxT (S = predicted spatial points and T = temporal points) containing the fitted values of the parameter Mt

seas: A "list" of objects of class "Seas", one for each seasonality of the model.

Methods

[`signature(x = "Mt", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "Mt", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Mt0-class *Class* "Mt0"

Description

"Mt0" contains the hyperprior values of the seasonal component and it is an internal class stored in "Parameters0".

Slots

seas0: A "list" of objects of class "Seas0", one for each seasonality of the model.

Methods

[`signature(x = "Mt0", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "Mt0", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Mu-class *Class* "Mu"

Description

"Mu" contains the parameter values of the mean component and is an internal class stored in "Parameters".

Slots

muvect: An Sx1 "matrix" (S is the number of spatial points of the predicted grid) containing the temporal autoregressive parameter muvect

mu0vect: An Sx1 "matrix" containing the temporal autoregressive parameter mu0vect

mu0L: A 3x1 "matrix" containing the temporal autoregressive parameter a0L

sigma2Mu: Contains the fitted value of the variance sigma2Mu.

spatialMu: An object of class "SpatParam" containing the fitted values of the spatial parameters of muvect.

Methods

[signature(x = "Mu", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Mu", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

`Mu0-class` *Class* `"Mu0"`

Description

`"Mu0"` contains the hyperprior values of the mean component and it is an internal class stored in the class `"Parameters0"`.

Slots

`mu0L0`: A `"vector"` of length 3 with the mean hyperprior values of the parameter `mu0L`

`sigmu0L0`: A `"matrix"` of dimension 3X3 with the hyperprior variance of the parameter `mu0L`

`sigma2Mu0`: A `"vector"` of length 2 with the hyperprior values of the parameter `sigma2Mu`

`spatialMu0`: An object of class `"SpatParam0"` containing the hyperprior values of the spatial parameters of `Mu`

Methods

`[` `signature(x = "Mu0", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

`[<-` `signature(x = "Mu0", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: `HBSTM-package`
Classes : `HBSTM`,`Parameters`,`Mu`,`Mt`,`Xt`,`Autoregressive`,`Seas`,`SpatParam`,`VectSubdiag`,`Hyperpriors`,`Mu0`,`Mt0`,`Xt0`,
Methods : `hbstm`,`hbstm.fit`,`results`,`estimation`,`resid`,`mse`
Plot : `plotRes`,`plotFit`
Data: `hirlam`,`coordinates`

Parameters-class *Class* "Parameters"

Description

"Parameters" contains all the values of the fitted HBSTM parameters and it is an internal class stored in "HBSTM".

Slots

Mu: An object of class "Mu" containing the parameters of the mean component.

Mt: An object of class "Mt" containing the parameters of the seasonal component.

Xt: An object of class "Xt" containing the parameters of the autoregressive space-time component.

Yt: A "matrix" of dimension SxT (S = predicted spatial points and T = temporal points) containing the fitted values of the parameter Yt

sigma2Y: Contains the fitted value of the variance sigma2Y.

sigma2E: Contains the fitted value of the variance sigma2E.

Methods

[signature(x = "Parameters", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Parameters", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

plotFit — *Plot the spatial data, estimation and residuals of an object of class* HBSTM

Description

Fits an object of class HBSTM

Usage

```
plotFit(object,time,values)
```

Arguments

object	An object of class "HBSTM".
time	A integer indicating the time data to show in the spatial grid. By default, it is the last temporal observation.
values	A "logical" indicating whether the function returns the values shown in the plot.

Value

By default, plotFit returns an object of class "NULL". If the attribute matrices is TRUE, plotFit returns a "data.frame" with three variables:

"Zt"	: The data in a fixed temporal observation specified by the attribute codetime.
"EstZt"	: The data estimation in a fixed temporal observation specified by the attribute codetime.
"Et"	: The residuals extracted from "Zt" and "EstZt".

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

plotRes *Residual Plots*

Description

Plot the residuals of the fitted values of an object of class HBSTM.

Usage

```
plotRes(object,point,ARlags,ARperiod)
```

Arguments

object	An object of class "HBSTM".
point	A integer indicating the spatial point to show the results. By default a random spatial point is selected.
ARlags	Maximum lag at which the ACF and the PACF are calculated. Default is 10*log10(N/m), where N is the number of observations and m the number of series. It will be automatically limited to one less than the number of observations in the series
ARperiod	The period of the data. Prints in red the lag in the period.

Value

null

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

`results` *Results summary*

Description

It shows the results of fitting an object of class `HBSTM`.

Usage

```
results(object,spatTemp,inter,digits,component,plots,file)
```

Arguments

`object`	An object of class `"HBSTM"`.
`spatTemp`	A list of vectors containing the spatial and the temporal points to show. See details.
`inter`	An optional numeric value for the interval credibility level. Default is 0.95
`digits`	Integer indicating the number of decimal places to `round` the values.
`component`	An optional `"character"` indicating which component have to be shown ("Parameters", "Mu", "Mt" or "Xt").
`plots`	Plot the medians and the credibility intervals of the parameters.
`file`	An optional "character" containing the name of the .tex file where the results are stored (in the current work directory). By default the function does not store the results.

Details

Each position in the `spaTemp` list contains a numerical vector, in which the first position refers to a spatial point of the data and the second position to a temporal point of the data.

Value

null

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: `HBSTM-package`
Classes : `HBSTM`,`Parameters`,`Mu`,`Mt`,`Xt`,`Autoregressive`,`Seas`,`SpatParam`,`VectSubdiag`,`Hyperpriors`,`Mu0`,`Mt0`,`Xt0`,
Methods : `hbstm`,`hbstm.fit`,`results`,`estimation`,`resid`,`mse`
Plot : `plotRes`,`plotFit`
Data: `hirlam`,`coordinates`

Examples

```
## See 'tutorial.pdf', included in the documentation of the package, to see a full example
```

Seas-class *Class* "Seas"

Description

"Seas" contains the parameter values of the seasonal component and is an internal class stored in "Mt".

Slots

w: The period of the seasonality

fvect: An Sx1 "matrix" (S is the number of spatial points of the predicted grid) containing the temporal autoregressive parameter fvect

f0L: A 3x1 "matrix" containing the temporal autoregressive parameter f0L

gvect: A Sx1 "matrix" containing the temporal autoregressive parameter gvect

g0L: A 3x1 "matrix" containing the temporal autoregressive parameter g0L

Methods

[signature(x = "Seas", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Seas", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Seas0-class *Class* "Seas0"

Description

"Seas0" contains the hyperprior values of the seasonal component and is an internal class stored in the class "Mt0".

Slots

f0L0: A "vector" of length 3 with the mean hyperprior values of the parameter f0L

sigf0L0: A "matrix" of dimension 3X3 with the hyperprior variance of the parameter f0L

g0L0: A "vector" of length 3 with the mean hyperprior values of the parameter g0L

sigg0L0: A "matrix" of dimension 3X3 with the hyperprior variance of the parameter g0L

Methods

[signature(x = "Seas0", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Seas0", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

SpatParam-class *Class* "SpatParam"

Description

"SpatParam" contains the values of the spatial parameters and is an internal class stored in the classes "Mu" and "Autorregressive".

Slots

`alpha`: A `"vector"` of length: the number of horizontal (east-west) spatial lags. It contains the fitted values of the horizontal spatial parameters.

`beta`: A `"vector"` of length: the number of vertical (north-south) spatial lags. It contains the fitted values of the vertical spatial parameters.

`phi`: A `"vector"` of length: the number of diagonal (southeast-northwest) spatial lags. It contains the fitted values of the diagonal spatial parameters.

`theta`: A `"vector"` of length: the number of inverse-diagonal (southwest-northeast) spatial lags. It contains the fitted values of the inverse-diagonal spatial parameters.

`Cmat`: An SxS `"matrix"` (S is the number of spatial points of the predicted grid) containing all the spatial parameters.

`lags`: A `"vector"` containing the spatial lags for each direction. Each position of the vector is related to the lags of alpha, beta, phi and theta, respectively.

`dirs`: A `"vector"` containing the considered spatial directions of the model.

Methods

[`signature(x = "SpatParam", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "SpatParam", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

SpatParam0-class *Class* "SpatParam0"

Description

`"SpatParam0"` contains the hyperprior values of the specified spatial parameters and is an internal class stored in the classes `"Mu0"` and `"Autorregressive0"`.

Slots

`alpha0`: A `"matrix"` of dimension 2X(Length of alpha vector) with the means in the first row and the variance in the second row.

`beta0`: A `"matrix"` of dimension 2X(Length of beta vector) with the means in the first row and the variance in the second row.

`phi0`: A `"matrix"` of dimension 2X(Length of phi vector) with the means in the first row and the variance in the second row.

`theta0`: A `"matrix"` of dimension 2X(Length of theta vector) with the means in the first row and the variance in the second row.

Methods

[`signature(x = "SpatParam0", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "SpatParam0", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

VectSubdiag-class *Class* "VectSubdiag"

Description

"VectSubdiag" contains all the values of the space-time parameters and it is an internal class stored in "Autorregressive".

Slots

`east`: A `"vector"` of length: the number of east spatial lags. It contains the fitted values of the east spatial-temporal parameters.

`west`: A `"vector"` of length: the number of west spatial lags. It contains the fitted values of the west spatial-temporal parameters.

`north`: A `"vector"` of length: the number of north spatial lags. It contains the fitted values of the north spatial-temporal parameters.

`south`: A `"vector"` of length: the number of south spatial lags. It contains the fitted values of the south spatial-temporal parameters.

`southeast`: A `"vector"` of length: the number of southeast spatial. It and contains the fitted values of the southeast spatial-temporal parameters.

`northwest`: A `"vector"` of length: the number of northwest spatial. It and contains the fitted values of the northwest spatial-temporal parameters.

`southwest`: A `"vector"` of length: the number of southwest spatial. It and contains the fitted values of the southwest spatial-temporal parameters.

`northeast`: A `"vector"` of length: the number of northeast spatial. It and contains the fitted values of the northeast spatial-temporal parameters.

`lags`: A `"vector"` containing the spatial lags for each direction. Each position of the vector is related to the lags of east, weast, north, south, southeast, northwest, southwest and northeast, respectively.

`dirs`: A `"vector"` containing all the space-time directions included in the model.

Methods

[`signature(x = "VectSubdiag", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "VectSubdiag", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

VectSubdiag0-class *Class* "VectSubdiag0"

Description

`"VectSubdiag0"` contains the hyperprior values of the specified space-time parameters, and it is an internal class stored in `"Autorregressive0"`

Slots

east0: A "matrix" of dimension 2X(Length of vector east) with the means in the first row and the variance in the second row.

west0: A "matrix" of dimension 2X(Length of vector west) with the means in the first row and the variance in the second row.

north0: A "matrix" of dimension 2X(Length of vector north) with the means in the first row and the variance in the second row.

south0: A "matrix" of dimension 2X(Length of vector south) with the means in the first row and the variance in the second row.

southeast0: A "matrix" of dimension 2X(Length of vector southeast) with the means in the first row and the variance in the second row.

northwest0: A "matrix" of dimension 2X(Length of vector northwest) with the means in the first row and the variance in the second row.

southwest0: A "matrix" of dimension 2X(Length of vector southwest) with the means in the first row and the variance in the second row.

northeast0: A "matrix" of dimension 2X(Length of vector northeast) with the means in the first row and the variance in the second row.

Methods

[`signature(x = "VectSubdiag0", i = "character", j = "missing", drop = "missing")`: extract the components of the model.

[<- `signature(x = "VectSubdiag0", i = "character", j = "missing")`: assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
Methods : hbstm,hbstm.fit,results,estimation,resid,mse
Plot : plotRes,plotFit
Data: hirlam,coordinates

Xt-class *Class* "Xt"

Description

"Xt" contains the parameter values of the autoregressive part and is an internal class stored in "Parameters".

Slots

Xt: A "matrix" of dimension SxT (S = predicted spatial points and T = temporal points) containing the fitted values of the parameter Xt.

X0: An Sx1 "matrix" containing the auxiliary parameter X0.

sigma2N: Contains the fitted value of the variance sigmaN.

AR: A "list" of objects of class Autoregressive, one for each temporal lag of the model.

templags: A "vector" containing the temporal lags of the model.

Methods

[signature(x = "Xt", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Xt", i = "character", j = "missing"): assign values to the components of the model..

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,M
Methods : hbstm,hbstm.fit,results,estimation,resid
Plot : plotRes

Xt0-class *Class* "Xt0"

Description

"Xt0" contains the hyperprior values of the autoregressive part and is an internal class and is stored in "Parameters0"

Slots

X00: A "vector" of length S (S is the number of spatial points of the predicted grid) with the mean hyperprior values of the parameter X0

sigma2X00: A "matrix" of dimension SXS with the hyperprior variance of the parameter X0

AR0: A "list" of objects of class "Autorregresive0", one for each temporal lag of the model.

sigma2N0: A "vector" of length 2 with the hyperprior values of the parameter sigma2N

Methods

[signature(x = "Xt0", i = "character", j = "missing", drop = "missing"): extract the components of the model.

[<- signature(x = "Xt0", i = "character", j = "missing"): assign values to the components of the model.

Author(s)

Pilar Munyoz and Alberto Lopez Moreno

See Also

Overview: HBSTM-package
Classes : HBSTM,Parameters,Mu,Mt,Xt,Autoregressive,Seas,SpatParam,VectSubdiag,Hyperpriors,Mu0,Mt0,Xt0,
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