Package ‘gstar’

October 13, 2022

Type Package
Title Generalized Space-Time Autoregressive Model
Version 0.1.0
Depends R (>= 2.10), ggplot2
Imports dplyr, xts, zoo, reshape2
License GPL-2 | GPL-3
Encoding UTF-8
LazyData true
RoxygenNote 6.1.1
Suggests testthat
NeedsCompilation no
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Repository CRAN
Date/Publication 2019-06-28 15:10:06 UTC

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gstar

Fit Generalized Space-Time Autoregressive Model

Description

gstar function return the parameter estimation of Generalized Space-Time Autoregressive Model.

Usage

gstar(x, weight, p = 1, d = 0, est = "OLS")

Arguments

x a dataframe, matrix or xts or ts object that contain time series data.
weight a spatial weight ncol(x) * ncol(x) with diagonal = 0.
p an autoregressive order, value must be greater than 0.
d a lag differencing order, value must be greater than 0.
est estimation method, currently only OLS available, another estimation will be added later.

Value

gstar returns output similar to lm, the detail are shown in the following list :

- coefficients - a named vector of coefficients.
- AIC - A version of Akaike’s An Information Criterion (the calculation is similar to aic in lm method )

References


See Also

summary for summarize the model that has been built. Also use predict to predict model to testing or new data.
Examples

```r
library(gstar)
library(xts)
data("LocationCPI")

#-----Use data with xts object----#
x = xts(LocationCPI[, -1], order.by = as.Date(LocationCPI[, 1]))

s <- round(nrow(x) * 0.8) ## split into training and testing (80:20)
x_train <- x[1:s, ]
x_test <- x[-c(1:s), ]

weight = matrix(c(0, 1, 1, 1,
                  1, 0, 1, 1,
                  1, 1, 0, 1,
                  1, 1, 1, 0), ncol = 4, nrow = 4)

weight = weight/(ncol(x) - 1) #the sum of weight is equal to 1 every row.

fit <- gstar(x_train, weight = weight,
             p = 1, d = 0, est = "OLS")
summary(fit)

performance(fit)
performance(fit, x_test) ## to check the performance with testing data

predict(fit, n = 10) #forecast 10 data ahead

plot(fit)
plot(fit, n_predict = 10) #plot with 10 forecasting data
plot(fit, testing = x_test)

#---- Use dataframe or matrix---#
x2 <- LocationCPI
x2$Date <- NULL # remove the date column

data(Loc)
dst <- as.matrix(dist(Loc[, -1], diag = TRUE, upper = TRUE))
dst1 <- matrix(0, nrow = nrow(dst), ncol = ncol(dst))

for(i in 1:nrow(dst)) {
  for(j in 1:ncol(dst)){
    if(j == i) next
    dst1[i, j] <- sum(dst[i, -j])/sum(dst[i,])
  }
}

weight_inverse_distance <- matrix(0,
nrow(dst), ncol = ncol(dst))

for(i in 1:nrow(dst)) {
    for(j in 1:ncol(dst)){
        if(j == i) next
        weight_inverse_distance[i, j] <- sum(dst1[i, j])/sum(dst1[i,])
    }
}

fit_inverse_distance <- gstar(x2, weight =
    weight_inverse_distance, p = 2, d = 1, est = "OLS")

summary(fit_inverse_distance)
performance(fit_inverse_distance)
predict(fit_inverse_distance)
plot(fit_inverse_distance)

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Loc | Coordinate of several region In Indonesia
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Description

A dataset containing the coordinate several region In Indonesia i.e Semarang, Surakarta, Tegal and Purwokerto.

Usage

data(Loc)

Format

A data frame with 4 rows and 3 variables:

**City**  Name of region/city

**latitude**  The latitude coordinate of each location

**longitude**  The longitude coordinate of each location
Description

A dataset containing the Consumer Price Index (CPI) in several region in Indonesia i.e Semarang, Surakarta, Tegal and Purwokerto, it is time series data with monthly periodicity from Jan 2006 to Sep 2014.

Usage

data(LocationCPI)

Format

A time series data frame with 105 rows and 5 variables:

- **Date**: date of CPI, monthly
- **Purwokerto**: The CPI of Purwokerto region
- **Surakarta**: The CPI of Purwokerto region
- **Semarang**: The CPI of Purwokerto region
- **Tegal**: The CPI of Purwokerto region

Source

https://www.bps.go.id/

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performance

*Calculate performance of prediction or forecasting*

Description

Calculate performance of prediction or forecasting

Usage

performance(object, testing = NULL, ...)

Arguments

- **object**: an object of class "gstar".
- **testing**: a dataframe or matrix or xts object that contain testing data. **Please be noted, if you fill the differencing order in the model estimation, you do not need difference your data anymore because we already cover that in this function**
- ... further arguments passed to or from other methods.
Value

- MSE fol all data - Mean Square Error for all the data combined
- MSE fol each location - Mean Square Error for each spatial location
- MAPE fol all data - Mean Absolute Percentage Error for all the data combined
- MAPE fol each location - Mean Absolute Percentage Error for each spatial location

plot.gstar      
Plotting the gstar object

Description
plotting the gstar object

Usage

## S3 method for class 'gstar'
plot(x, testing = NULL, n_predict = NULL, ...)

Arguments

x               an object of class "gstar".
testing         The testing data to be plotted.
n_predict       The number of steps ahead for which prediction is required.
...             further arguments passed to or from other methods.

predict.gstar  
Predicting the gstar object

Description
Predicted values based on gstar object object

Usage

## S3 method for class 'gstar'
predict(object, n = NULL, ...)

Arguments

object          an object of class "gstar".
n               The number of steps ahead for which prediction is required.
...             further arguments passed to or from other methods.
**Summary of Generalized Space-Time Autoregressive Fits**

**Description**

This function is similar to summary of "lm" or "glm" object.

**Usage**

```r
## S3 method for class 'gstar'
summary(object, ...)
```

**Arguments**

- `object` an object of class "gstar".
- `...` further arguments passed to or from other methods.
  - `coefficients` - a named vector of coefficients.
  - `AIC` - A version of Akaike's An Information Criterion.
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