Package 'DZEXPM'

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Type Package

Title Estimation and Prediction of Skewed Spatial Processes

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Description A collection of functions designed to estimate and predict skewed spatial processes, and a real data set.

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LazyData true

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`DZEXPM-package` *Estimation and Prediction of Skewed Spatial Processes*

Description

DZEXPM contains the function to estimate and predict skewed spatial processes.

Details

Asymmetric spatial processes arise naturally in finance, economics, hydrology and ecology. For such processes, Double Zero Expectile (DZEXP) normal process is proposed in Majumdar and Paul (2015). By using a Bayesian methodology, Wang, Yang and Majumdar (2017) show that by adding measurement error to the DZEXP model (DZEXPM), a reasonably flexible model is obtained, which is also computationally tractable in the literature.

As an example, a skewed data set on maximum annual temperature obtained from weather stations in Louisiana and Texas of year 2003 is attached to test the DZEXPM package.

Author(s)

Jiangyan Wang, Miao Yang and Anandamayee Majumdar

References

Majumdar, A and Paul, D. (2015). Zero expectile processes and Bayesian spatial regression. Journal of Computational and Graphical Statistics, 25(3).

Wang, J., Yang, M. and Majumdar, A. (2017). Comparative Study and Sensitivity Analysis of Skewed Spatial Processes.

`dzexpm` *The estimation and prediction function for the skewed spatial processes*

Description

This function provides a way to combine the estimation and prediction procedure for the skewed spatial processes.

Usage

```
dzexpm(y_ful, x_ful, n_ful, n, u1, u2, theta, p, iter, loopiter)
```

Arguments

`y_ful`	the full response variable of a dataset
`x_ful`	the full covariates of a dataset
`n_ful`	the full number of the spatial locations in a dataset
`n`	the number of spatial locations being employed to estimate and evaluate the spatial process
`u1`	horizontal coordinate of the spatial locations
`u2`	vertical coordinate of the spatial locations
`p`	is a useful parameter to capture the "skewness" of the process, which belongs in (0,1)
`theta`	the range parameter of the covariance kernel in the spatial process
`iter`	the MCMC iterations to update the parameters
`loopiter`	the burn in size

Details

This function is generated according to the spatial model, Double Zero Expectile Normal Process with measurement error, which has good prediction performance. See the references for details.

Value

A date.frame is returned which includes quantities "DIC", "coverage", "bias.med", "mpe.med" and "SD.med", where "DIC" stands for the Deviance Information Criterion (DIC), see Gelman et al. (2004), and "coverage", "bias.med", "mpe.med" and "SD.med" represent the median of prediction coverage, bias, mean prediction error and standard error over MCMC scheme iterations, respectively, for the predictive performance of the skewed spatial process.

Author(s)

Jiangyan Wang, Miao Yang and Anandamayee Majumdar

References

Wang, J., Yang, M. and Majumdar, A. (2017). Comparative Study and Sensitivity Analysis of Skewed Spatial Processes.

Gelman, A., Carlin, J., Stern, H. and Rubin, D. (2004). Bayesian Data Analysis: Second Edition. Texts in Statistical Science. CRC Press. ISBN 1-58488-388-X. LCCN 2003051474. MR 2027492.

Examples

```
real<- as.matrix(do.call(cbind, MaxTemp03))
n_ful<- nrow(real)
y_ful<- real[,2]
x_ful<- real[,7]
x_ful<- log(x_ful)
x_ful<- scale(x_ful)
u1<- real[,3]
u2<- real[,4]
theta<- 2/150000
n<- 56
p<- 0.1
dzexpm(y_ful, x_ful, n_ful, n, u1, u2, theta, p, 50, 20)
```

MaxTemp03 *Maximum annual temperature in the year 2003 of 76 spatially located stations in the states of Louisiana and Texas*

Description

This data set contains the maximum annual temperature in the year 2003 of 76 spatially located stations in the states of Louisiana and Texas, as the response variable, and elevation as the covariate.

Usage

```
data("MaxTemp03")
```

Format

A data frame with 76 observations on the following 7 variables.

`stn` a numeric vector for the station number

`temMax` a numeric vector for the maximum temperature

`utmn` a numeric vector for the North UTM (UNIVERSAL TRANSVERSE MERCARTOR GRID SYSTEM)

`utme` a numeric vector for the South UTM (UNIVERSAL TRANSVERSE MERCARTOR GRID SYSTEM)

`lat` a numeric vector for latitude

`long` a numeric vector for longitude

`elevate` a numeric vector for elevation

Details

This is an illustrative data set obtained for a collection of stations in Texas and Louisiana. The collection was from the NOAA Satellite and Information Service involving global climate and weather.

Source

The data link is: http://www.ncdc.noaa.gov /cgi-bin/res40.pl?page=gsod.html

References

Wang, J., Yang, M. and Majumdar, A. (2017). Comparative Study and Sensitivity Analysis of Skewed Spatial Processes.

Examples

```
data(MaxTemp03)
```

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