Package 'ZINAR1'

Type Package

Title Simulates ZINAR(1) Model and Estimates Its Parameters Under Frequentist Approach

Version 0.1.0

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Description Generates Realizations of First-Order Integer Valued Autoregressive Processes with Zero-Inflated Innovations (ZINAR(1)) and Estimates its Parameters as described in Garay et al. (2021) <doi:10.1007/978-3-030-82110-4_2>.

License GPL (>= 3.0)

Imports gamlss.dist, VGAM, MASS, statmod, gtools, graphics, stats, scales

Suggests devtools, roxygen2

Encoding UTF-8

LazyData true

RoxygenNote 7.2.1

Depends R (>= 4.0)

NeedsCompilation no

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Repository CRAN

Date/Publication 2022-11-02 14:30:12 UTC

R topics documented:

EST_ZINAR   *Parameter Estimation for ZINAR(1) Models*

Description

This function uses the EM algorithm to find the maximum likelihood estimates of a ZINAR(1) model.

Usage

```
EST_ZINAR(y,init = NULL,tol = 1e-05,iter = 1000,model,innovation,desc = FALSE)
```

Arguments

y	A vector containing a discrete non-negative time series dataset.
init	A vector containing the initial parameters estimates to maximize the likelihood function. If not informed, uses Yule-Walker method to calculate.
tol	Tolerance for the convergence of the algorithm. Defaults to 1e-5.
iter	Maximum number of iterations of the algorithm. Defaults to 1000.
model	Must be "zinar", if the innovation have Zero-Inflated distribution, and "inar", otherwise.
innovation	Must be "Po" if Poisson, "NB" if Negative binomial or "GI" if Gaussian inverse.
desc	TRUE to plot the exploratory graphs. Defaults to FALSE.

Value

Returns a list containing the parameters estimates and the number of interactions.

References

Aldo M.; Medina, Francyelle L.; Jales, Isaac C.; Bertail, Patrice. First-order integer valued AR processes with zero-inflated innovations. Cyclostationarity: Theory and Methods, Springer Verlag - 2021, v. 1, p. 19-40.

Examples

```
# Estimates the parameters of an INAR(1) and a ZINAR(1) models with Poisson innovations
# for the monthly number of drug offenses recorded from January 1990 to December 2001
# in Pittsburgh census tract 2206.

data(PghTracts)

y=ts(PghTracts$DRUGS,start=c(1990,1),end=c(2001,12),frequency=12)

Inar1 = EST_ZINAR(y, init = c(0.3,0.5,2), model = "inar", innovation = "Po",desc = TRUE)
```

```
ZIPInar1 = EST_ZINAR(y, init = c(0.3,0.5,2), model = "zinar", innovation = "Po",desc = TRUE)
```

PghTracts   *Drug Offenses*

Description

Monthly number of drug offenses recorded from January 1990 to December 2001, with 144 observations, in Pittsburgh census tract 2206.

Usage

```
PghTracts
```

Format

A data frame with 144 rows and 4 columns containing the census tract and the variables YEAR,MONTH and DRUGS.

Source

Aldo M.; Medina, Francyelle L.; Jales, Isaac C.; Bertail, Patrice. First-order integer valued AR processes with zero-inflated innovations. Cyclostationarity: Theory and Methods, Springer Verlag - 2021, v. 1, p. 19-40. DOI: 10.1007/978-3-030-82110-4_2

SIM_ZINAR   *Simulate values for ZINAR(1)*

Description

This function generates realizations of a ZINAR(1) process.

Usage

```
SIM_ZINAR(n, alpha, rho, th, innovation)
```

Arguments

n	Number of realizations of the ZINAR(1) process.
alpha	The probability of an element remaining in the process. The parameter alpha must be in [0,1].
rho	The probability of the innovation be from the state zero. The parameter rho must be in [0,1].

th	Is equal the value of the parameter lambda, if the innovations follow a Zero-Inflated Poisson (ZIP) distribution, and is a vector containing the values of the parameters (mu,phi), if the innovations follow a Zero-Inflated Negative Binomial (ZINB) or Zero-Inflated Inverse Gaussian (ZIPIG) distribution.
innovation	Must be "Po" if Poisson, "NB" if Negative binomial or "GI" if Gaussian inverse.

Value

Returns a numeric vector representing a realization of a ZINAR(1) process.

References

Aldo M.; Medina, Francyelle L.; Jales, Isaac C.; Bertail, Patrice. First-order integer valued AR processes with zero-inflated innovations. Cyclostationarity: Theory and Methods, Springer Verlag - 2021, v. 1, p. 19-40.

Examples

```
# Simulates values for ZIPInar1 model and estimate its parameters.

set.seed(5)

model = "zinar"
innv = "Po"
y = SIM_ZINAR(n = 500,alpha = 0.3,rho = 0.5,th = 3,innovation = innv)
ZIPInar1 = EST_ZINAR(y,model=model,innovation=innv,desc = TRUE)
```

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