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 Pro-
cesses with Zero-Inflated Innovations (ZINAR(1)) and Estimates its Parameters as de-
scribed 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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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

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)

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### 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**


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### 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


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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