

Package ‘ZINAR1’

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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](https://doi.org/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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Contents

EST_ZINAR	2
PghTracts	3
SIM_ZINAR	3

Index	5
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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

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

Index

* **datasets**

PghTracts, 3

EST_ZINAR, 2

PghTracts, 3

SIM_ZINAR, 3