

# 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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**Repository** CRAN

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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)
```

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PghTracts

*Drug Offenses*


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**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

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SIM\_ZINAR

*Simulate values for ZINAR(1)*


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**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)
```

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\* **datasets**

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