

# Package ‘TSMN’

April 4, 2017

**Type** Package

**Title** Truncated Scale Mixtures of Normal Distributions

**Version** 1.0.0

**Author** Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br> and Aldo William Medina Garay <agaray@de.ufpe.br>

**Maintainer** Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br>

**Description** Return the first four moments of the SMN distributions (Normal, Student-t, Pearson VII, Slash or Contaminated Normal).

**License** GPL (>= 3.0)

**Encoding** UTF-8

**LazyData** true

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2017-04-04 06:13:02 UTC

## R topics documented:

|                         |   |
|-------------------------|---|
| TSMN . . . . .          | 1 |
| TSMNgenerator . . . . . | 2 |
| TSMNmoments . . . . .   | 4 |

|              |          |
|--------------|----------|
| <b>Index</b> | <b>6</b> |
|--------------|----------|

---

|      |   |
|------|---|
| TSMN | <i>Truncated Scale Mixtures of Normal Distributions</i> |
|------|---|

---

## Description

This package includes two functions related to the truncated scale mixtures of normal distribution. One of them is to generate random samples from TSMN distribution, and other is to compute the first four theoretical moments.

**Author(s)**

Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br> and Aldo M. Garay <agaray@de.ufpe.br>

Maintainer: Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br>

**References**

Aldo M. Garay, Victor H. Lachos, Heleno Bolfarine, Celso R. Cabral. "Linear censored regression models with scale mixtures of normal distributions". Statistical Papers, 2017, vol. 58, issue 1, pages 247-278

**See Also**

[TSMNmoments](#), [TSMNgenerator](#)

**Examples**

```
## A test sample to compare theoretical and empirical moments, considering the following parameters:

mu = 2
sigma2 = 4
nu = 5
lower = -3
upper = 10
dist = "T"
n = 10000

## Theoretical moments with TSMNmoments
theor<-TSMNmoments(mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)

## Generate the sample with TSMNgenerator to compute the empirical moments
empir<-TSMNgenerator(n=n, mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)

## Compare the results
data.frame("1st" = c("Theoretic" = theor$EY1, "Empirical" = mean(empir)),
          "2nd" = c("Theoretic" = theor$EY2, "Empirical" = mean(empir^2)),
          "3rd" = c("Theoretic" = theor$EY3, "Empirical" = mean(empir^3)),
          "4th" = c("Theoretic" = theor$EY4, "Empirical" = mean(empir^4)))
```

---

TSMNgenerator

*Generator of Truncated Scale Mixtures of Normal Distributions*

---

**Description**

This function generate random TSMN samples from Normal, Student-t, Slash and Contaminated Normal, using the the inverse method.

**Usage**

```
TSMNgenerator(n, mu, sigma2, nu = NULL, lower = -Inf, upper = Inf, dist = "Normal")
```

**Arguments**

|        |   |
|--------|---|
| n      | Number of observations.   |
| mu     | Location parameter.   |
| sigma2 | Scale parameter.  |
| nu     | Parameter of the scale variable of the SMN family. Must be NULL in case of Normal distribution. Must be a bidimensional vector in case of contaminated normal distribution (CNormal). |
| lower  | Lower bounds.   |
| upper  | Upper bounds.   |
| dist   | Distribution to be used: "Normal" for Normal model, "T" for Student-t model, "Slash" for slash model and "CNormal" for contaminated Normal model.                                     |

**Details**

For the contaminated Normal distribution, each component of the bidimensional vector "nu" must lie on (0,1).

**Value**

Returns the sample generated according to the parameters.

**Author(s)**

Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br> and Aldo M. Garay <agaray@de.ufpe.br>  
Maintainer: Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br>

**References**

Aldo M. Garay, Victor H. Lachos, Heleno Bolfarine, Celso R. Cabral. "Linear censored regression models with scale mixtures of normal distributions". Statistical Papers, 2017, vol. 58, issue 1, pages 247-278

**See Also**

[TSMNmoments](#)

**Examples**

```
## A test sample to compare theoretical and empirical moments, considering the following parameters:  
  
mu = 2  
sigma2 = 4  
nu = 5  
lower = -3
```

```

upper = 10
dist = "T"
n = 10000

## Theoretical moments with TSMNmoments
theor<-TSMNmoments(mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)

## Generate the sample with TSMNgenerator to compute the empirical moments
empir<-TSMNgenerator(n=n, mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)

## Compare the results
data.frame("1st" = c("Theoretic" = theor$EY1, "Empirical" = mean(empir)),
          "2nd" = c("Theoretic" = theor$EY2, "Empirical" = mean(empir^2)),
          "3rd" = c("Theoretic" = theor$EY3, "Empirical" = mean(empir^3)),
          "4th" = c("Theoretic" = theor$EY4, "Empirical" = mean(empir^4)))

```

---

TSMNmoments

*Moments of Truncated Scale Mixtures of Normal Distributions*


---

### Description

Return the first four moments of TSMN distributions, as example Normal, Student-t, Pearson VII, Slash or Contaminated Normal.

### Usage

```
TSMNmoments(mu, sigma2, nu=NULL, delta=NULL, lower=-Inf, upper=Inf, dist="Normal")
```

### Arguments

|        |   |
|--------|---|
| mu     | Location parameter.   |
| sigma2 | Scale parameter.  |
| nu     | Parameter of the scale variable of the SMN family. Must be NULL in case of Normal distribution. Must be a bidimensional vector in case of contaminated normal distribution (CNormal). |
| delta  | Second parameter of Pearson VII. Must not be provided in case of Normal, Student-t or Slash distribution.   |
| lower  | Lower bounds.   |
| upper  | Upper bounds.   |
| dist   | Distribution to be used: "Normal" for Normal model, "T" for Student-t model, "PearsonVII" for Pearson VII model, "Slash" for slash model and "CNormal" for contaminated Normal model. |

### Details

For the contaminated Normal distribution, each component of the bidimensional vector "nu" must lie on (0,1).

**Value**

|     |                   |
|-----|-------------------|
| EY1 | The first moment  |
| EY2 | The second moment |
| EY3 | The third moment  |
| EY4 | The fourth moment |

**Author(s)**

Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br> and Aldo M. Garay <agaray@de.ufpe.br>

Maintainer: Eraldo B. dos Anjos Filho <ebdaf1@de.ufpe.br>

**References**

Aldo M. Garay, Victor H. Lachos, Heleno Bolfarine, Celso R. Cabral. "Linear censored regression models with scale mixtures of normal distributions". Statistical Papers, 2017, vol. 58, issue 1, pages 247-278

**See Also**

[TSMNgenerator](#)

**Examples**

```
## A test sample to compare theoretical and empirical moments, considering the following parameters:
```

```
mu = 2
sigma2 = 4
nu = 5
lower = -3
upper = 10
dist = "T"
n = 10000
```

```
## Theoretical moments with TSMNmoments
theor<-TSMNmoments(mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)
```

```
## Generate the sample with TSMNgenerator to compute the empirical moments
empir<-TSMNgenerator(n=n, mu=mu, sigma2=sigma2, nu=nu, lower=lower, upper=upper, dist=dist)
```

```
## Compare the results
```

```
data.frame("1st" = c("Theoretic" = theor$EY1, "Empirical" = mean(empir)),
           "2nd" = c("Theoretic" = theor$EY2, "Empirical" = mean(empir^2)),
           "3rd" = c("Theoretic" = theor$EY3, "Empirical" = mean(empir^3)),
           "4th" = c("Theoretic" = theor$EY4, "Empirical" = mean(empir^4)))
```

# Index

\*Topic **generator of truncated scale mixtures of normal distributions**

TSMNgenerator, [2](#)

\*Topic **moments of truncated scale mixtures of normal distributions**

TSMNmoments, [4](#)

\*Topic **truncated scale mixtures of normal distribution**

TSMN, [1](#)

TSMNgenerator, [2](#)

TSMNmoments, [4](#)

\*Topic **tsmn**

TSMN, [1](#)

TSMNgenerator, [2](#)

TSMNmoments, [4](#)

TSMN, [1](#)

TSMNgenerator, [2](#), [2](#), [5](#)

TSMNmoments, [2](#), [3](#), [4](#)