

Package ‘TSMN’

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Type Package

Title Truncated Scale Mixtures of Normal Distributions

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

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TSMN	<i>Truncated Scale Mixtures of Normal Distributions</i>
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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.

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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.

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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

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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)))
```

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