# Package 'TSMSN'

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**Title** Truncated Scale Mixtures of Skew-Normal Distributions

**Version** 0.0.1

**Description** Return the first four moments, estimation of parameters and sample of the TSMSN distributions (Skew Normal, Skew t, Skew Slash or Skew Contaminated Normal).

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**Encoding** UTF-8

**LazyData** true

**Imports** sn, mvtnorm, numDeriv, progress

**RoxygenNote** 6.1.1

**NeedsCompilation** no

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**Repository** CRAN

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eTSMSN                                          *Estimate the parameters of Truncated Scale Mixtures of Skew-Normal Distributions*

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### Description

This function obtains the maximum likelihood estimators of the TSMSN (Skew-Normal, Skew-t, Skew-Slash and Skew-Contaminated Normal) distribution parameters by direct maximization.

### Usage

```
eTSMSN(x, mu = 0.01, sigma2 = 1.01, lambda = 0, nu = 5, a = -Inf,
  b = Inf, dist = "SN", shape = FALSE)
```

### Arguments

| | |
|---|---|
| x | Dataset. |
| mu | Initial location parameter (Optional). |
| sigma2 | Initial scale parameter (Optional). |
| lambda | Initial skewness parameter (Optional). |
| nu | Fixed shape parameter. Must be NULL in case of Skew-Normal distribution. Must be a bidimensional vector in case of skew-contaminated normal distribution (SCN) and contaminated normal distribution (CN). |
| a | Lower bound. |
| b | Upper bound. |
| dist | Distribution to be used: "SN" for Skew-Normal model, "ST" for Skew-t model, "SSL" for Skew-slash model and "SCN" for Skew-contaminated Normal model. |
| shape | For ST, SSL and SCN distribution. Consider the parameter nu as fixed and known. If TRUE nu must be provided. |

### Details

For the SMN family, consider lambda = 0. For the Skew-contaminated Normal and Contaminated Normal distribution, each component of the bidimensional vector "nu" must be on (0,1). For the estimation in the cases of distributions ST, SSL and SCN nu is considered fixed, but may be known or unknown. The shape parameter is the one that regulates if nu is known or unknown.

### Value

Returns a vector with the maximum likelihood estimators of the distribution parameters.

### References

Lachos, V. H.; Garay, A. M.; Cabral, C. R. "Moments of truncated scale mixtures of skew-normal distributions." Brazilian Journal of Probability and Statistics (In press).

Basso, Rodrigo M., et al. "Robust mixture modeling based on scale mixtures of skew-normal distributions." Computational Statistics & Data Analysis 54.12 (2010): 2926-2941.

## Examples

```
x <- rTSMSN(n = 100, mu = 0, sigma2 = 1, lambda = 0, nu = NULL, a = -2, b = 2, dist = "SN")
eTSMSN(x, a = -2, b = 2, dist = "SN")
```

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mTSMSN                    *Moments of Truncated Scale Mixtures of Skew-Normal Distributions*

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## Description

Return the first four moments of the TSMSN distributions (Skew Normal, Skew t, Skew Slash or Skew Contaminated Normal).

## Usage

```
mTSMSN(mu = 0, sigma2 = 1, lambda = 0, nu = NULL, a = -Inf,
  b = Inf, dist = "SN", empir = TRUE)
```

## Arguments

| | |
|---|---|
| mu | Location parameter. |
| sigma2 | Scale parameter. |
| lambda | Skewness parameter. |
| nu | Shape parameter. Must be NULL in case of Skew-Normal distribution. Must be a bidimensional vector in case of skew-contaminated normal distribution (SCN) and contaminated normal distribution (CN). |
| a | Lower bound. |
| b | Upper bound. |
| dist | Distribution to be used: "SN" for Skew-Normal model, "ST" for Skew-t model, "SSL" for Skew-slash model and "SCN" for Skew-contaminated Normal model. |
| empir | If TRUE provides the empirical moments. |

## Details

For the SMN family, consider lambda = 0. For the Skew-contaminated Normal and Contaminated Normal distribution, each component of the bidimensional vector "nu" must be on (0,1).

## Value

Returns the four moments, the skewness (S), kurtosis (k) and coefficient of variation(CV). If "empir = TRUE", returns also the Empirical moments.

## References

Lachos, V. H.; Garay, A. M.; Cabral, C. R. "Moments of truncated scale mixtures of skew-normal distributions." Brazilian Journal of Probability and Statistics (In press).

Basso, Rodrigo M., et al. "Robust mixture modeling based on scale mixtures of skew-normal distributions." Computational Statistics & Data Analysis 54.12 (2010): 2926-2941.

**Examples**

```
mTSMSN(mu = 1, sigma2 = 1, nu = NULL, lambda = 1, a = -2, b = 2, dist = "SN", empir = TRUE)
```

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| rTSMSN | *Generate the Truncated Scale Mixtures of Skew-Normal Distributions* |
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**Description**

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

**Usage**

```
rTSMSN(n, mu = 0, sigma2 = 1, lambda = 0, nu = NULL, a = -Inf,
  b = Inf, dist = "SN")
```

**Arguments**

| | |
|---|---|
| n | Number of observations. |
| mu | Location parameter. |
| sigma2 | Scale parameter. |
| lambda | Skewness parameter. |
| nu | Shape parameter. Must be NULL in case of Skew-Normal distribution. Must be a bidimensional vector in case of skew-contaminated normal distribution (SCN) and contaminated normal distribution (CN). |
| a | Lower bound. |
| b | Upper bound. |
| dist | Distribution to be used: "SN" for Skew-Normal model, "ST" for Skew-t model, "SSL" for Skew-slash model and "SCN" for Skew-contaminated Normal model. |

**Details**

For the SMN family, consider lambda = 0. For the Skew-contaminated Normal and Contaminated Normal distribution, each component of the bidimensional vector "nu" must be on (0,1).

**Value**

Returns a vector with the sample generated according to the distribution and parameters defined.

**References**

Lachos, V. H.; Garay, A. M.; Cabral, C. R. "Moments of truncated scale mixtures of skew-normal distributions." Brazilian Journal of Probability and Statistics (In press).

Basso, Rodrigo M., et al. "Robust mixture modeling based on scale mixtures of skew-normal distributions." Computational Statistics & Data Analysis 54.12 (2010): 2926-2941.

**Examples**

```
rTSMSN(n = 100, mu = 0, sigma2 = 1, nu = NULL, lambda = 0, a = -Inf, b = Inf, dist = "SN")
```

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