Package ‘Sim.PLFN’

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Description The definition of fuzzy random variable and the methods of simulation from fuzzy random variables are two challenging statistical problems in three recent decades. This package is organized based on a special definition of fuzzy random variable and simulate fuzzy random variable by Piecewise Linear Fuzzy Numbers (PLFNs); see Coroianu et al. (2013) <doi:10.1016/j.fss.2013.02.005> for details about PLFNs. Some important statistical functions are considered for obtaining the membership function of main statistics, such as mean, variance, summation, standard deviation and coefficient of variance. Some of applied advantages of ‘Sim.PLFN’ package are: (1) Easily generating / simulation a random sample of PLFN, (2) drawing the membership functions of the simulated PLFNs or the membership function of the statistical result, and (3) Considering the simulated PLFNs for arithmetic operation or importing into some statistical computation. Finally, it must be mentioned that ‘Sim.PLFN’ package works on the basis of ‘FuzzyNumbers’ package.
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R topics documented:

  Sim.PLFN-package .................................................. 2
  cuts.to.PLFN .................................................... 4
  CV ............................................................... 5
  Mean .............................................................. 6
Simulation of Piecewise Linear Fuzzy Numbers

Description

This package is organized based on a special definition of fuzzy random variable and simulate fuzzy random variable by Piecewise Linear Fuzzy Numbers (PLFNs). Some important statistical functions are considered for obtaining the membership function of main statistics, such as mean, variance, summation, standard deviation and coefficient of variance. Some of applied advantages of 'Sim.PLFN' Package are: (1) Easily generating / simulation a random sample of PLFN, (2) drawing the membership functions of the simulated PLFNs or the membership function of the statistical result, and (3) Considering the simulated PLFNs for arithmetic operation or importing into some statistical computation.

Author(s)

Abbas Parchami

References


Gagolewski, M., Caha, J. (2015) A guide to the FuzzyNumbers package for R (FuzzyNumbers version 0.4-1) http://FuzzyNumbers.rexamine.com

See Also

DISTRIB FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

library(FuzzyNumbers)

# Example 1: Let x ~ N(0, 2) ; s_X'~1-Exp(3) ; s_X'r-beta(1,3) 
n=3; knot.n=3
Sample <- S.PLFN( n, knot.n, type="PLFI",
Sim.PLFN-package

```r
X.dist="norm", X.dist.par=c(0,2),
s1X.dist="exp", s1X.dist.par=3,
srX.dist="beta", srX.dist.par=c(1,3)
Sample
Sample[,3]

# For plotting random fuzzy sample:
xlim = c( min(Sample), max(Sample) )
plot( cuts.to.PLFN(Sample[,1]), type="o", xlim=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="o", add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="o", add=TRUE )
abline( h=round((knot.n+1)/(knot.n+1)), lty=3, col="gray70"

# Example 2:
n=9; knot.n=9
Sample <- S.PLFN( n, knot.n,
X.dist="norm", X.dist.par=c(5,2),
s1X.dist="chisq", s1X.dist.par=1,
srX.dist="unif", srX.dist.par=c(0,3)
Sample
Sample[,9]

# For plotting random fuzzy sample:
xlim = c( min(Sample), max(Sample) )
plot( cuts.to.PLFN(Sample[,1]), type="b", col=1, xlim=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="b", col=2, add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="b", col=3, add=TRUE )
plot( cuts.to.PLFN(Sample[,4]), type="b", col=4, add=TRUE )
plot( cuts.to.PLFN(Sample[,5]), type="b", col=5, add=TRUE )
plot( cuts.to.PLFN(Sample[,6]), type="b", col=6, add=TRUE )
plot( cuts.to.PLFN(Sample[,7]), type="b", col=7, add=TRUE )
plot( cuts.to.PLFN(Sample[,8]), type="b", col=8, add=TRUE )
plot( cuts.to.PLFN(Sample[,9]), type="b", col=9, add=TRUE )
abline( h=round((knot.n+1)/(knot.n+1)), lty=3, col="gray70"

# Example 3: (Four Arithmetic Operations on PLFNs)
if(!require(FuzzyNumbers))
  install.packages("FuzzyNumbers")
library(FuzzyNumbers)
Sample <- S.PLFN( n=2, knot.n=9,
X.dist="unif", X.dist.par=c(1,3),
s1X.dist="beta", s1X.dist.par=c(4,3),
srX.dist="beta", srX.dist.par=c(1/3,2/3)
Sample
```
# For plotting random fuzzy sample:
xlim = c( min(sample), max(sample) )
plot( cuts.to.PLFN(sample[,1]), type="b", xlim=xlim )
plot( cuts.to.PLFN(sample[,2]), type="b", add=TRUE )
abline( h=round(knot.n+1):0/(knot.n+1),4, lty=3, col="gray70")

X1 = cuts.to.PLFN( sample[,1] )
X2 = cuts.to.PLFN( sample[,2] )

### Now working with four arithmatic operations +, -, * and / are simple as follows:

summ = X1 + X2 ; summ
dist = X1 - X2 ; dist
prod = X1 * X2 ; prod
divi = X1 / X2 ; divi

xlim = c(min(summ["a1"],dist["a1"],prod["a1"],divi["a1"]),
max(summ["aT"],dist["aT"],prod["aT"],divi["aT"]) )

# For plotting random fuzzy sample:
plot( cuts.to.PLFN(sample[,1]), type="b", xlim=xlim )
plot( cuts.to.PLFN(sample[,2]), type="b", add=TRUE )
abline( h=round(knot.n+1):0/(knot.n+1),4, lty=3, col="gray70")

plot(summ, type="b", xlim=c(0, 12), add=TRUE, col=2, lwd=2)
plot(dist, type="b", xlim=c(0, 12), add=TRUE, col=3, lwd=2)
plot(prodd, type="b", xlim=c(0, 12), add=TRUE, col=4, lwd=2)
plot(divi, type="b", xlim=c(0, 12), add=TRUE, col=5, lwd=2)

abline(v=c(X1["a2"],X2["a2"],summ["a2"],dist["a2"],prod["a2"],divi["a2"]), col=
1:5, lty=3)
legend("topright", c("X1 & X2", "X1 + X2", "X1 - X2", "X1 * X2", "X1 / X2"), col=1:5,
text.col = 1, lwd=2 )

---

### Description

This function can easily covert a cuts matrix into a Piecewise Linear Fuzzy Number.

### Usage

cuts.to.PLFN(cuts)

### Arguments

- **cuts**: A matrices, with knot.n raw and 2 column, which contains all information about a Piecewise Linear Fuzzy Number.
Value

This function returned a Piecewise Linear Fuzzy Number.

References

Gagolewski, M., Caha, J. (2015) A guide to the FuzzyNumbers package for R (FuzzyNumbers version 0.4-1) http://FuzzyNumbers.rexamine.com

See Also

DISTRIBUT FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

```r
if(!require(FuzzyNumbers)){install.packages("FuzzyNumbers")}
library(FuzzyNumbers)

knot.n = 2
T <- PLFN( knot.n=knot.n,
X.dist="norm", X.dist.par=c(0,1),
slx.dist="exp", slx.dist.par=3,
srx.dist="beta", srX.dist.par=c(1,3)
)

plot(T, type="b")
CUTS <- PLFN.to.cuts(T, knot.n)
CUTS

T2 = cuts.to.PLFN(CUTS)
plot(T2, type="b", col=2, add=TRUE, lwd=3, lty=3)
```

<table>
<thead>
<tr>
<th>CV</th>
<th>Coefficient of variation for n PLFNs</th>
</tr>
</thead>
</table>

Description

This function is able to calculate the coefficient of variation (CV) of a sample from Piecewise Linear Fuzzy Numbers (PLFNs).

Usage

CV(S.PLFN)
Arguments

S.PLFN A sample from Piecewise Linear Fuzzy Numbers (PLFNs), with n PLFNs. This sample is an array with \( \text{dim} = (\text{knot.n+2}, n) \).

Value

This function returned a Piecewise Linear Fuzzy Number as the coefficient of variation of several PLFNs.

See Also

DISTRIB FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

```r
library(FuzzyNumbers)
n=3; knot.n=4
Sample <- S.PLFN( n, knot.n,
X.dist="norm", X.dist.par=c(3,2),
s1X.dist="exp", s1X.dist.par=3, 
srX.dist="beta", srX.dist.par=c(1,3)
)
Sample

# For plotting random fuzzy sample:
xlim = c(0, max(Sample[knot.n+2,2]))
plot( cuts.to.PLFN(Sample[,1]), type="b", xlim=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="b", add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="b", add=TRUE )
abline( h=round((knot.n+1):0/(knot.n+1),4), lty=3, col="gray70")
```

FuzzyNumbers::plot(Mean(Sample), col=4, lwd=2, add=TRUE, type="b")
plot(Var(Sample), col=3, lwd=2, add=TRUE, type="b")
plot(Sd(Sample), col=6, lwd=2, add=TRUE, type="b")

CV = CV(Sample)
CV
PLFN.to.cuts(CV, knot.n)
plot(CV, col=2, lwd=2, add=TRUE, type="b")

---

### Mean

**Mean of n Piecewise Linear Fuzzy Numbers**

Description

This function is able to calculate the mean (average) of a sample from Piecewise Linear Fuzzy Numbers (PLFNs).
Usage

Mean(S.PLFN)

Arguments

S.PLFN A sample from Piecewise Linear Fuzzy Numbers (PLFNs), with n PLFNs. This sample is an array with dim=c(knot.n+2,2,n).

Value

This function returned a Piecewise Linear Fuzzy Number.

See Also

DISTRIBUT, FuzzyNumbers, FuzzyNumbers.Ext.2, Calculator.LR.FNs

Examples

library(FuzzyNumbers)

n=3; knot.n=4
Sample <- S.PLFN( n, knot.n, X.dist="pois", X.dist.par=5, slX.dist="exp", slX.dist.par=3, srX.dist="beta", srX.dist.par=c(1,3) )
Sample

# For plotting random fuzzy sample:
xlim = c( min(Sample), max(Sample) )
plot( cuts.to.PLFN(Sample[,1]), type="b", xlab=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="b", add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="b", add=TRUE )
abline( h=round((knot.n+1):0/(knot.n+1)), lty=3, col="gray70")
M = Mean(Sample)
M
plot( M, type="b", add=TRUE, col=2, lwd=3 )

---

**PLFN**

*Simulate a random Piecewise Linear Fuzzy Number*

Description

This function is able to produce / simulate a Piecewise Linear Fuzzy Number (PLFN).

Usage

```
PLFN(knot.n, type = "PLFN", X.dist, X.dist.par, slX.dist, slX.dist.par, srX.dist, srX.dist.par)
```
Arguments

knot.n

the number of knots; see package FuzzyNumbers for more details.

type

The possible values of this argument is type = c("Tri", "Tra", "PLFN", "PLFI").

In other words, this function returned one of following fuzzy numbers: (1) Triangular Fuzzy Number (when type = "Tri"), (2) Trapezoidal Fuzzy Number (when type = "Tra"), (3) Piecewise Linear Fuzzy Number (when type = "PLFN"), and (4) Piecewise Linear Fuzzy Interval (when type = "PLFI").

X.dist

The distribution name of the random variable (for simulate the core of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

X.dist.par

A vector of distribution parameters (for simulate the core of random fuzzy number) with considered ordering in stats package.

slX.dist

The distribution name of the random variable (for simulate the left spread value of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

slX.dist.par

A vector of distribution parameters (for simulate the left spread value of random fuzzy number) with considered ordering in stats package.

srX.dist

The distribution name of the random variable (for simulate the right spread value of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

srX.dist.par

A vector of distribution parameters (for simulate the right spread value of random fuzzy number) with considered ordering in stats package.

Value

Considering the type argument, this function returned/simulate/create one of following fuzzy numbers: (1) Triangular Fuzzy Number, (2) Trapezoidal Fuzzy Number, (3) Piecewise Linear Fuzzy Number, and (4) Piecewise Linear Fuzzy Interval.

References


Gagolewski, M., Caha, J. (2015) A guide to the FuzzyNumbers package for R (FuzzyNumbers version 0.4-1) http://FuzzyNumbers.rexamine.com

See Also

DISTRIBUT FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

# Example: Let x ~ ( X~N(3,0.2) ; s_x~1~Exp(3) ; s_x~r~U(0,2) )
if(!require(FuzzyNumbers)){install.packages("FuzzyNumbers")}
library(FuzzyNumbers)
knot.n = 2
P <- PLFN( knot.n, type="Tri",
X.dist="norm", X.dist.par=c(3,.2),
srX.dist="exp", srX.dist.par=3,
srX.dist="unif", srX.dist.par=c(0,2)
)
p
plot(P, lwd=3, type="b")
abline( h=round((knot.n+1):0/(knot.n+1),4), v=alphacut(P, round((knot.n+1):0/(knot.n+1),4) ),
lty=3, col=2 )

P <- PLFN( knot.n, type="Tra",
X.dist="norm", X.dist.par=c(3,1),
srX.dist="exp", srX.dist.par=3,
srX.dist="unif", srX.dist.par=c(0,2)
)
plot(P, lwd=3, type="b")
abline( h=round((knot.n+1):0/(knot.n+1),4), v=alphacut(P, round((knot.n+1):0/(knot.n+1),4) ),
lty=3, col=2 )

# Try once again by knot.n=10

knot.n = 2
P <- PLFN( knot.n, type="PLFN",
X.dist="norm", X.dist.par=c(3,1),
srX.dist="exp", srX.dist.par=3,
srX.dist="unif", srX.dist.par=c(0,2)
)
plot(P, lwd=3)
abline( h=round((knot.n+1):0/(knot.n+1),4), v=alphacut(P, round((knot.n+1):0/(knot.n+1),4) ),
lty=3, col=2 )

knot.n = 2
P <- PLFN( knot.n, type="PLF1",
X.dist="norm", X.dist.par=c(3,1),
srX.dist="exp", srX.dist.par=3,
srX.dist="unif", srX.dist.par=c(0,2)
)
plot(P, lwd=3, type="b")
abline( h=round((knot.n+1):0/(knot.n+1),4), v=alphacut(P, round((knot.n+1):0/(knot.n+1),4) ),
lty=3, col=2 )

plot(P, type="b", col=2, lty=1, lwd=3, add=FALSE)
# Some of possible types are:
# "p" for points,
# "l" for lines,
# "b" for both,
# "c" for the lines part alone of "b",
# "o" for both over plotted,
# "h" for histogram like (or high-density) vertical lines,
# "s" for stair steps,
# "S" for other steps,
# "n" for no plotting.

P
P["a1"] #First point of support
P["a2"] #First point of core
P["a3"] #End point of core
P["a4"] #End point of support

core(P)
supp(P)
alphacut(P, 0.5)
abline(h=0.5, lty=3)

evaluate(P, 3.5)
round( evaluate(P, seq(0,4, by=.5)), 2)

---

PLFN.to.cuts

Convert Piecewise Linear Fuzzy Number to a cuts matrix

Description

This function can easily covert a Piecewise Linear Fuzzy Number (PLFN) into a cuts matrix.

Usage

PLFN.to.cuts(P, knot.n)

Arguments

P
A Piecewise Linear Fuzzy Number (PLFN).

knot.n
the number of knots; see package FuzzyNumbers for more details.

Value

This function returned a matrix which contains core, support and knot.n cuts of the considered PLFN.

See Also

DISTRIB FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs
Examples

```r
t <- PLFN( knot.n=knot.n, x.dist="norm", x.dist.par=c(0,1), s1.x.dist="exp", s1.x.dist.par=3, s2.x.dist="beta", s2.x.dist.par=c(1,3) )

T
FuzzyNumbers::plot(T, type="b")
cuts <- PLFN.to.cuts(T, knot.n)
cuts
cuts[,"L"] # Lower bounds of cuts
cuts[,"U"] # Upper bounds of cuts
cuts[2,] # Or equivalently cuts["0.6667",]
```

---

**S.PLFN**

Simulate a random sample from Piecewise Linear Fuzzy Numbers

---

**Description**

This function is able to produce / simulate a random sample from Piecewise Linear Fuzzy Numbers (PLFNs).

**Usage**

```r
S.PLFN(n, knot.n, type = "PLFN", x.dist, x.dist.par, s1.x.dist, s1.x.dist.par, s2.x.dist, s2.x.dist.par)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>the size of random sample of PLSNs.</td>
</tr>
<tr>
<td>knot.n</td>
<td>the number of knots; see package FuzzyNumbers for more details.</td>
</tr>
<tr>
<td>type</td>
<td>The possible values of this argument is type = c(&quot;Tri&quot;, &quot;Tra&quot;, &quot;PLFN&quot;, &quot;PLFI&quot;) .</td>
</tr>
<tr>
<td></td>
<td>In other words, this function returned one of following fuzzy numbers: (1) Triangular Fuzzy Number ( when type = &quot;Tri&quot; ), (2) Trapezoidal Fuzzy Number ( when type = &quot;Tra&quot; ), (3) Piecewise Linear Fuzzy Number ( when type = &quot;PLFN&quot; ), and (4) Piecewise Linear Fuzzy Interval ( when type = &quot;PLFI&quot; ).</td>
</tr>
<tr>
<td>x.dist</td>
<td>The distribution name of the random variable (for simulate the core of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.</td>
</tr>
<tr>
<td>x.dist.par</td>
<td>A vector of distribution parameters (for simulate the core of random fuzzy number) with considered ordering in stats package.</td>
</tr>
</tbody>
</table>
slX.dist  The distribution name of the random variable (for simulate the left spread value of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

slX.dist.par  A vector of distribution parameters (for simulate the left spread value of random fuzzy number) with considered ordering in stats package.

srX.dist  The distribution name of the random variable (for simulate the right spread value of random fuzzy number) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

srX.dist.par  A vector of distribution parameters (for simulate the right spread value of random fuzzy number) with considered ordering in stats package.

Value

Considering the type argument, this function returned/simulate/create one of following fuzzy numbers: (1) Triangular Fuzzy Number, (2) Trapezoidal Fuzzy Number, (3) Piecewise Linear Fuzzy Number, and (4) Piecewise Linear Fuzzy Interval.

References


Gagolewski, M., Caha, J. (2015) A guide to the FuzzyNumbers package for R (FuzzyNumbers version 0.4-1) http://FuzzyNumbers.rexamine.com

See Also

DISTRIBUT FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

library(FuzzyNumbers)

# Let x ~ ( X~N(0,1) ; s_X~1~Exp(3) ; s_X~r~beta(1,3) )

n=3; knot.n=3

Sam <- S.PLFN( n=3, knot.n=4, type="Tra", X.dist="norm", X.dist.par=c(0,1), slX.dist="exp", slX.dist.par=3, srX.dist="beta", srX.dist.par=c(1,3) )

Sam

Sam[,"X3"]

# For plotting random fuzzy sample:
xlim = c( min(Sam), max(Sam) )
plot( cuts.to.PLFN(Sam[,1]), type="b", col=1, xlim=xlim )
plot( cuts.to.PLFN(Sam[,2]), type="b", col=2, add=TRUE )
plot( cuts.to.PLFN(Sam[,3]), type="b", col=3, add=TRUE )
**Standard of Deviation of n Piecewise Linear Fuzzy Numbers**

**Description**

This function is able to calculate the Standard of Deviation for a sample with size \(n\) from Piecewise Linear Fuzzy Numbers (PLFNs).

**Usage**

\[
\text{Sd}(S, \text{PLFN})
\]

**Arguments**

- `S, PLFN`: A sample from Piecewise Linear Fuzzy Numbers (PLFNs), with \(n\) PLFNs. This sample is an array with \(\dim = c(knot.n+2, 2, n)\).

**Value**

This function returned a Piecewise Linear Fuzzy Number.

**See Also**

- `DISTRIB`
- `FuzzyNumbers`
- `FuzzyNumbers.Ext.2`
- `Calculator.LR.FNs`

**Examples**

```r
if(!require(FuzzyNumbers)) {install.packages("FuzzyNumbers")}
library(FuzzyNumbers)

n = 3; knot.n = 4
Sample <- S, PLFN(n, knot.n, 
X.dist="norm", X.dist.par=c(3, 2), 
slx.dist="exp", slx.dist.par=3, 
srx.dist="beta", srx.dist.par=c(1, 3) 
)
Sample

# For plotting random fuzzy sample:
xlim = c(0, max(Sample[knot.n+2, 2]))
plot( cuts.to.PLFN(Sample[,1]), type="b", xlim=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="b", add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="b", add=TRUE )
abline( h=round((knot.n+1):0/(knot.n+1), 4), lty=3, col="gray70")

plot(Mean(Sample), col=4, lwd=2, add=TRUE, type="b")
```
Summation of \( n \) Piecewise Linear Fuzzy Numbers

**Description**

This function is able to calculate the summation of a sample from Piecewise Linear Fuzzy Numbers (PLFNs).

**Usage**

Sum(S.PLFN)

**Arguments**

- **S.PLFN**: A sample from Piecewise Linear Fuzzy Numbers (PLFNs), with \( n \) PLFNs. This sample is an array with \( \text{dim}=c(\text{knot}+1, n) \).

**Value**

This function returned a Piecewise Linear Fuzzy Number.

**See Also**

DISTRIB FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

**Examples**

```r
if(!require(FuzzyNumbers)){install.packages("FuzzyNumbers")}
library(FuzzyNumbers)

n=3; knot.n=4
Sample <- S.PLFN( n, knot.n,
  X.dist="pois", X.dist.par=5,
  slX.dist="exp", slX.dist.par=3,
  srX.dist="beta", srX.dist.par=c(1,3)
)
Sample
S = Sum(Sample)

# For plotting random fuzzy sample:
xlim = c(min(Sample[knot.n+2,1]),S["a4"])
plot( cuts.to.PLFN(Sample[,1]), type="o", xlim=xlim )
```
Simulation from a Truncated Distribution

Description
This function can simulation from a truncated distribution which is used for generating the left and right spreads of Piecewise Linear Fuzzy Numbers (PLFNs).

Usage
Trunc(n, T.dist, T.dist.par, L = -Inf, R = Inf)

Arguments
n
The sample size.

T.dist
The distribution name of random variable (which one needs its truncated version) is determined by characteristic element T.dist. The names of distributions is similar to stats package.

T.dist.par
A vector of distribution parameters (which one needs its truncated version) with considered ordering in stats package.

L
The left point of truncation of distribution.

R
The right point of truncation of distribution.

Details
The goal of introducing Trunc function in this package is only using in PLFN and S.PLFN functions.

Value
A vector of random data from the considered truncated distribution.

See Also
DISTRIBUT
Examples

# Truncated Normal Distribution:

data1 = Trunc(n=10^4, T.dist="norm", T.dist.par=c(5,2), L=3, R=10)
hist(data1)

data2 = Trunc(n=1000, T.dist="chisq", T.dist.par=4, L=0, R=12)
hist(data2)

data3 = Trunc(n=10^4, T.dist="norm", T.dist.par=c(5,2), L=3)
hist(data3)

Description

This function is able to calculate the variance of a sample with size n from Piecewise Linear Fuzzy Numbers (PLFNs).

Usage

Var(sNPFLN)

Arguments

S.PFLN

A sample from Piecewise Linear Fuzzy Numbers (PLFNs), with n PLFNs. This sample is an array with dim=c(knot.n+2,2,n).

Value

This function returned a Piecewise Linear Fuzzy Number as the variance of PLFNs.

See Also

DISTRIB FuzzyNumbers FuzzyNumbers.Ext.2 Calculator.LR.FNs

Examples

if(!require(FuzzyNumbers)){install.packages("FuzzyNumbers")}
library(FuzzyNumbers)

n=3; knot.n=4
Sample <- S.PFLN( n, knot.n, 
X.dist="norm", X.dist.par=c(3,2), 
s1X.dist="exp", s1X.dist.par=3, 
srX.dist="beta", srX.dist.par=c(1,3) )
Sample

# For plotting random fuzzy sample:
xlim = c( min(Sample), max(Sample) )
plot( cuts.to.PLFN(Sample[,1]), type="o", xlim=xlim )
plot( cuts.to.PLFN(Sample[,2]), type="o", add=TRUE )
plot( cuts.to.PLFN(Sample[,3]), type="o", add=TRUE )
abline( h=round((knot.n+1)/((knot.n+1),4), lty=3, col="gray70")

plot(Mean(Sample), col=4, lwd=2, add=TRUE, type="b", pch=2)
S2 = Var(Sample)
S2
PLFN.to.cuts(S2, knot.n)
plot(S2, col=2, lwd=2, add=TRUE, type="b", pch=3)
Index

*Topic CV
  cuts.to.PLFN, 4
  Mean, 6
  PLFN, 7
  PLFN.to.cuts, 10
  S.PLFN, 11
  Sd, 13
  Sim.PLFN-package, 2
  Sum, 14
  Var, 16

*Topic FuzzyNumber
  cuts.to.PLFN, 4
  CV, 5
  Mean, 6
  PLFN, 7
  PLFN.to.cuts, 10
  S.PLFN, 11
  Sd, 13
  Sim.PLFN-package, 2
  Sum, 14
  Var, 16

*Topic Mean
  cuts.to.PLFN, 4
  CV, 5
  Mean, 6
  PLFN, 7
  PLFN.to.cuts, 10
  S.PLFN, 11
  Sd, 13
  Sim.PLFN-package, 2
  Sum, 14
  Var, 16

*Topic PLFN.to.cuts
  cuts.to.PLFN, 4
  CV, 5
  Mean, 6
  PLFN, 7
  S.PLFN, 11
  Sd, 13
  Sim.PLFN-package, 2
  Sum, 14
  Var, 16

*Topic Sd
  cuts.to.PLFN, 4
  CV, 5
Mean, 6
PLFN, 7
PLFN.to.cuts, 10
S.PLFN, 11
Sim.PLFN-package, 2
Sum, 14
Var, 16

*Topic **Sum**
Mean, 6
Var, 16

*Topic **TrapezoidalFuzzyNumber**
cuts.to.PLFN, 4
CV, 5
Mean, 6
PLFN, 7
PLFN.to.cuts, 10
S.PLFN, 11
Sd, 13
Sim.PLFN-package, 2
Sum, 14
Var, 16

*Topic **TriangularFuzzyNumber**
cuts.to.PLFN, 4
CV, 5
Mean, 6
PLFN, 7
PLFN.to.cuts, 10
S.PLFN, 11
Sd, 13
Sim.PLFN-package, 2
Sum, 14
Var, 16

*Topic **Var**
cuts.to.PLFN, 4
CV, 5
Mean, 6
PLFN, 7
PLFN.to.cuts, 10
S.PLFN, 11
Sd, 13
Sim.PLFN-package, 2
Sum, 14

*Topic **cuts.to.PLFN**
cuts.to.PLFN, 4
CV, 5

cuts.to.PLFN, 4
CV, 5

Mean, 6
PLFN, 7
PLFN.to.cuts, 10
S.PLFN, 11
Sim.PLFN-package, 2
Sum, 14
Var, 16

Trunc, 15
Var, 16