Package ‘ecotoxicology’

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Title Methods for Ecotoxicology

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Description Implementation of the EPA's Ecological Exposure Research Division (EERD) tools (discontinued in 1999) for Probit and Trimmed Spearman-Karber Analysis.
Probit and Spearman-Karber methods from Finney's book ``Probit analysis a statistical treatment of the sigmoid response curve" with options for most accurate results or identical results to the book.
Probit and all the tables from Finney's book (code-generated, not copied) with the generating functions included.
Control correction: Abbott, Schneider-Orelli, Henderson-Tilton, Sun-Shepard.
Toxicity scales: Horsfall-Barratt, Archer, Gauhl-Stover, Fullerton-Olsen, etc.

License GPL (>= 3)

Depends R (>= 2.10)

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`AdjustAbbott` *Calculate corrected efficacy % with Abbott's formula*

Description

Returns the corrected efficacy % with Abbott's formula

Usage

```
AdjustAbbott(smoothedObservedProportion, ps0 = smoothedObservedProportion[1],
  p1 = 1)
```

Arguments

`smoothedObservedProportion`	numeric vector, treated population
`ps0`	numeric vector, control
`p1`	numeric vector, percentage 0 to1 or 0 to 100 (p1=1 or P1=100)

Value

the corrected efficacy %

Author(s)

Jose Gama

Source

ehabsoft, last accessed 2015 http://www.ehabsoft.com/ldpline/onlinecontrol.htm

References

Puntener W., 1981 Manual for field trials in plant protection second edition. Agricultural Division, Ciba-Geigy Limited.

Examples

```
#same result as example on Short-term Methods for Estimating the Chronic Toxicity of
#Effluents and Receiving Waters to Freshwater Organisms.TABLE J1. page 312
data(SheepsheadMinnow40SK)
IsMonotonicallyIncreasing(SheepsheadMinnow40SK[,2]/40)
mydata <- cbind(SheepsheadMinnow40SK,
  MakeMonotonicallyIncreasing(cbind(rep(40,6),SheepsheadMinnow40SK[,2])))
AdjustAbbott(mydata[,3])
```

`AdjustHendersonTilton` *Calculate corrected efficacy % with Henderson-Tilton's formula*

Description

Returns the corrected efficacy % with Henderson-Tilton's formula

Usage

```
AdjustHendersonTilton(smoothedObservedProportion,
  ps0 = smoothedObservedProportion[1], p1 = 1)
```

Arguments

`smoothedObservedProportion`	numeric vector, treated population
`ps0`	numeric vector, control
`p1`	numeric vector, percentage 0 to1 or 0 to 100 (p1=1 or P1=100)

Value

the corrected efficacy %

Author(s)

Jose Gama

Source

ehabsoft, last accessed 2015 http://www.ehabsoft.com/ldpline/onlinecontrol.htm

References

Puntener W., 1981 Manual for field trials in plant protection second edition. Agricultural Division, Ciba-Geigy Limited.

`AdjustSchneiderOrelli` *Calculate corrected efficacy % with Schneider-Orelli's formula*

Description

Returns the corrected efficacy % with Schneider-Orelli's formula

Usage

```
AdjustSchneiderOrelli(smoothedObservedProportion,
  ps0 = smoothedObservedProportion[1], p1 = 1)
```

Arguments

`smoothedObservedProportion`	numeric vector, treated population
`ps0`	numeric vector, control
`p1`	numeric vector, percentage 0 to1 or 0 to 100 (p1=1 or P1=100)

Value

the corrected efficacy %

Author(s)

Jose Gama

Source

ehabsoft, last accessed 2015 http://www.ehabsoft.com/ldpline/onlinecontrol.htm

References

Puntener W., 1981 Manual for field trials in plant protection second edition. Agricultural Division, Ciba-Geigy Limited.

`AdjustSunShepard` *Calculate corrected efficacy % with Sun-Shepard's formula*

Description

Returns the corrected efficacy % with Sun-Shepard's formula

Usage

```
AdjustSunShepard(smoothedObservedProportion,
  ps0 = smoothedObservedProportion[1], p1 = 1)
```

Arguments

`smoothedObservedProportion`	numeric vector, treated population
`ps0`	numeric vector, control
`p1`	numeric vector, percentage 0 to1 or 0 to 100 (p1=1 or P1=100)

Value

the corrected efficacy %

Author(s)

Jose Gama

Source

ehabsoft, last accessed 2015 http://www.ehabsoft.com/ldpline/onlinecontrol.htm

References

Puntener W., 1981 Manual for field trials in plant protection second edition. Agricultural Division, Ciba-Geigy Limited.

AphisRumicisDerrisMalaccensis *data on the toxicity to Aphis rumicis of an ether extract of Derris malaccensis*

Description

data on the toxicity to Aphis rumicis of an ether extract of Derris malaccensis

Usage

```
AphisRumicisDerrisMalaccensis
```

Details

- concentration. concentration
- n. number of insects
- r. number of observed affected

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. pp 238. Cambridge University Press

Martin, J. T ., 1940 The problem of the evaluation of rotenone-containing plants. V. The relative toxicities of different species of derris. Ann. Appl. Biol. 27, 274-94.

ArcsinToPercentage *Convert Arcsin values to percentages*

Description

Converts Arcsin values to percentages

Usage

```
ArcsinToPercentage(myarcsin)
```

Arguments

myarcsin	numeric vector

Value

percentages

Author(s)

Jose Gama

References

Statistical tests for significance, accessed October 2015 http://archive.bio.ed.ac.uk/jdeacon/statistics/tress4.html

Examples

```
a<-c(.1,.5,1:10,50,96,97,98,99.5,99.99,99.999,99.9999)
b<-PercentageToProbit(a)
d<-ProbitToPercentage(b)
e<-PercentageToArcsin(d)
f<-ArcsinToPercentage(e)
```

`CalculateLC50` *Calculate LC50 from a matrix with 3 columns: concentration, number of exposed subjects and number of deaths*

Description

Returns the LC50 from a matrix with 3 columns: concentration, number of exposed subjects and number of deaths

Usage

```
CalculateLC50(matrixConcExpoResp)
```

Arguments

`matrixConcExpoResp` numeric vector

Value

the LC50

Author(s)

Jose Gama

References

Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977. Trimmed spearman-karber method for estimating median Lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12(4):417 (1978).

Examples

```
#Data from the example on page 5:
#Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977.
#Trimmed spearman-karber method for estimating median
#Lethal concentrations in toxicity bioassays.
#Environ. Sci. Technol. 11(7): 714-719;
#Correction 12(4):417 (1978).
concentration<-c(.5,1,2,4,8)
exposed<-c(10,10,10,10,10)
mortality<-c(0,2,4,9,10)
CalculateLC50(cbind(concentration, exposed, mortality))
```

CalculateLCn *Calculate LC for N between 0 (LC0) and 100 (LC100)*

Description

Returns the LC for n between 0 and 100

Usage

```
CalculateLCn(x, n, r, N = 50)
```

Arguments

x	numeric, log concentration
n	numeric, number of insects
r	numeric, number of observed affected
N	numeric, Lethal Concentration "N"

Value

the LC for n between 0 and 100

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`Dunnett.t.Statistic` *Critical Values of Dunnett's t Statistic*

Description

Critical Values of Dunnett's t Statistic, Two-Tailed Comparisons

Usage

```
Dunnett.t.Statistic
```

Details

Critical Values of Dunnett's t Statistic - data columns

- df. Degress of freedom.
- alpha. significance level.
- 2. k=2, Number of Treatment Means, Including Control.
- 3. k=3, Number of Treatment Means, Including Control.
- 4. k=4, Number of Treatment Means, Including Control.
- 5. k=5, Number of Treatment Means, Including Control.
- 6. k=6, Number of Treatment Means, Including Control.
- 7. k=7, Number of Treatment Means, Including Control.
- 8. k=8, Number of Treatment Means, Including Control.
- 9. k=9, Number of Treatment Means, Including Control.
- 10. k=10, Number of Treatment Means, Including Control.

Author(s)

Jose Gama

References

C. W. Dunnett, 1964. New tables for multiple comparisons with a control. Biometrics 20. 482–491.

erfinv *Inverse error function*

Description

Returns the inverse error function

Usage

```
erfinv(x)
```

Arguments

x	numeric vector

Value

the inverse error function

Author(s)

Jose Gama

References

Abramowitz and Stegun 29.2.29 http://stat.ethz.ch/R-manual/R-devel/library/stats/html/Normal.html

Examples

```
erfinv(1:10)
```

GenTableIFinney1964 *Generate table I from Finney1964 "Transformation of percentages to probits"*

Description

Generates table I from Finney1964 "Transformation of percentages to probits"

Usage

```
GenTableIFinney1964()
```

Value

table I from Finney1964 "Transformation of percentages to probits"

- Percentage. Percentage.
- Col0.0. Column for 0.0
- Col0.1. Column for 0.1
- Col0.2. Column for 0.2
- Col0.3. Column for 0.3
- Col0.4. Column for 0.4
- Col0.5. Column for 0.5
- Col0.6. Column for 0.6
- Col0.7. Column for 0.7
- Col0.8. Column for 0.8
- Col0.9. Column for 0.9

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableIFinney1964()
```

GenTableIIFinney1964 *Generate table II from Finney1964 "The weighting coefficient and Q/Z"*

Description

Generates table II from Finney1964 "The weighting coefficient and Q/Z"

Usage

```
GenTableIIFinney1964()
```

Value

table II from Finney1964 "The weighting coefficient and Q/Z"

- Y. expected probit
- Q/Z.
- C=0. 0
- C=1. 1 ...
- C=89. 89
- C=90. 90

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableIIFinney1964()
```

GenTableIIIFinney1964 *Generate table III from Finney1964 "Maximum and minimum working probits and range"*

Description

Generates table III from Finney1964 "Maximum and minimum working probits and range"

Usage

```
GenTableIIIFinney1964()
```

Value

table III from Finney1964 "Maximum and minimum working probits and range"

- Ymin. Minimum working probit - expected
- Y0. Minimum working probit - Y0 = Y-P/Z
- Yrange. Range 1/Z
- Y100. Maximum working probit - Y100 = Y+Q/Z
- Ymax. Maximum working probit - expected

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableIIIFinney1964()
```

`GenTableIVFinney1964` *Generate table IV from Finney1964 "Working probits"*

Description

Generates table IV from Finney1964 "Working probits"

Usage

```
GenTableIVFinney1964()
```

Value

table IV from Finney1964 "Working probits"

- Kill
- Col2 Expected probit 2.0
- Col2.1 Expected probit 2.1 ...
- Col7.8 Expected probit 7.8
- Col7.9 Expected probit 7.9

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableIVFinney1964()
```

GenTableIXFinney1964 *Generate table IX from Finney1964 "Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling"*

Description

Generates table IX from Finney1964 "Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling"

Usage

```
GenTableIXFinney1964()
```

Value

table IX from Finney1964 "Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling"

- Y. Expected probit
- MinWorkProbit. Minimum working probit
- Range. Range 1/Z
- WeightingCoef. Weighting Coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableIXFinney1964()
```

GenTableVFinney1964 *Generate table V from Finney1964 "The Probability, P, the Ordinate, Z, and Z^2"*

Description

Generates table V from Finney1964 "The Probability, P, the Ordinate, Z, and Z^2"

Usage

```
GenTableVFinney1964()
```

Value

table V from Finney1964 "The Probability, P, the Ordinate, Z, and Z^2"

- Y. Expected probit
- P. Probability P of expected probit
- Z. Ordinate to the normal distribution corresponding to the probability P
- Z^2. Z^2

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableVFinney1964()
```

GenTableVIFinney1964 *Generate table VI from Finney1964 "Distribution of chi^2"*

Description

Generates table VI from Finney1964 "Distribution of chi^2"

Usage

```
GenTableVIFinney1964()
```

Value

table VI from Finney1964 "Distribution of chi^2"

- Deg.freedom. Degrees of freedom
- 0.9. Probability 0.9
- 0.7. Probability 0.7
- 0.5. Probability 0.5
- 0.3. Probability 0.3
- 0.1. Probability 0.1
- 0.05. Probability 0.05
- 0.02. Probability 0.02
- 0.01. Probability 0.01
- 0.001. Probability 0.001

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableVIFinney1964()
```

`GenTableVIIFinney1964` *Generate table VII from Finney1964 "Distribution of t"*

Description

Generates table VII from Finney1964 "Distribution of t"

Usage

```
GenTableVIIFinney1964()
```

Value

table VII from Finney1964 "Distribution of t"

- Deg.freedom. Degrees of freedom
- 0.9. Probability 0.9
- 0.7. Probability 0.7
- 0.5. Probability 0.5
- 0.3. Probability 0.3
- 0.1. Probability 0.1
- 0.05. Probability 0.05
- 0.02. Probability 0.02
- 0.01. Probability 0.01
- 0.001. Probability 0.001

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableVIIFinney1964()
```

GenTableVIIIFinney1964

Generate table VIII from Finney1964 "The Weighting Coefficient in Wadley's Problem"

Description

Generates table VIII from Finney1964 "The Weighting Coefficient in Wadley's Problem"

Usage

```
GenTableVIIIFinney1964()
```

Value

table VIII from Finney1964 "The Weighting Coefficient in Wadley's Problem"

- Y. Expected probit
- w. Weighting Coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
GenTableVIIIFinney1964()
```

IsMonotonicallyDecreasing

Determine if a series is monotonically decreasing

Description

Returns TRUE if all proportions are in a monotonically decreasing sequence

Usage

```
IsMonotonicallyDecreasing(p)
```

Arguments

p	numeric vector

Value

True is the series is monotonically decreasing

Author(s)

Jose Gama

References

Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977. Trimmed spearman-karber method for estimating median Lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12(4):417 (1978).

Examples

```
IsMonotonicallyDecreasing(1:10)
IsMonotonicallyDecreasing(6:2)
IsMonotonicallyDecreasing(c(1,3,2))
```

`IsMonotonicallyIncreasing` *Determine if a series is monotonically increasing*

Description

Returns TRUE if all proportions are in a monotonically increasing sequence

Usage

```
IsMonotonicallyIncreasing(p)
```

Arguments

p	numeric vector

Value

True is the series is monotonically increasing

Author(s)

Jose Gama

References

Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977. Trimmed spearman-karber method for estimating median Lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12(4):417 (1978).

Examples

```
#Data from the example on page 8:
#Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977.
#Trimmed spearman-karber method for estimating median
#Lethal concentrations in toxicity bioassays.
#Environ. Sci. Technol. 11(7): 714-719;
#Correction 12(4):417 (1978).
concentration<-c(1.1,2.3,4.5,8.8,17.1)
exposed<-c(10,10,9,10,10)
mortality<-c(1,5,4,2,7)
p<-mortality/exposed
x<-log(concentration)
IsMonotonicallyIncreasing(p)
```

MakeMonotonicallyDecreasing
Make monotonically decreasing sequence

Description

Returns a monotonically decreasing sequence

Usage

```
MakeMonotonicallyDecreasing(matrixExpoResp)
```

Arguments

matrixExpoResp	numeric vector or matrix

Value

monotonically decreasing sequence

Author(s)

Jose Gama

References

Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977. Trimmed spearman-karber method for estimating median Lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12(4):417 (1978).

MakeMonotonicallyIncreasing
Smoothed Mortality Proportion (monotonically increasing sequence)

Description

Returns the Smoothed Mortality Proportion (monotonically increasing sequence)

Usage

```
MakeMonotonicallyIncreasing(matrixExpoResp)
```

Arguments

matrixExpoResp	numeric vector or matrix

Value

The Smoothed Mortality Proportion (monotonically increasing sequence)

Author(s)

Jose Gama

References

Hamilton, m.a., R.c. Russo, and r.v. Thurston, 1977. Trimmed spearman-karber method for estimating median Lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7): 714-719; Correction 12(4):417 (1978).

`PercentageToArcsin` *Convert percentages to Arcsin values*

Description

Converts percentages to Arcsin values

Usage

```
PercentageToArcsin(mypercentage)
```

Arguments

`mypercentage`	numeric vector

Value

Arcsin values

Author(s)

Jose Gama

References

Statistical tests for significance, accessed October 2015 http://archive.bio.ed.ac.uk/jdeacon/statistics/tress4.html

Examples

```
a<-c(.1,.5,1:10,50,96,97,98,99.5,99.99,99.999,99.9999)
b<-PercentageToProbit(a)
d<-ProbitToPercentage(b)
e<-PercentageToArcsin(d)
```

PercentageToProbit *Convert percentages to Probit values*

Description

Converts percentages to Probit values

Usage

```
PercentageToProbit(mypercentage)
```

Arguments

mypercentage	numeric vector

Value

Probit values

Author(s)

Jose Gama

References

Statistical tests for significance, accessed October 2015 http://archive.bio.ed.ac.uk/jdeacon/statistics/tress4.html

Examples

```
a<-c(.1,.5,1:10,50,96,97,98,99.5,99.99,99.999,99.9999)
b<-PercentageToProbit(a)
```

ProbitApproxStandardErrorOfDosage *Approximate Standard Error of dosage*

Description

Approximate Standard Error of dosage

Usage

```
ProbitApproxStandardErrorOfDosage(b, Snw)
```

Arguments

b	numeric, rate of increase of probit value per unit increase in x
Snw	numeric, sum of nw

Value

Approximate Standard Error of dosage

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

ProbitChi *Estimate the column for Chi calculation*

Description

Estimates the column for Chi calculation

Usage

```
ProbitChi(r, n, P)
```

Arguments

r	numeric vector, number of observed affected
n	numeric vector, number of insects
P	numeric vector, Probability P of expected probit

Value

numeric vector

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`ProbitEPA` *Probit estimation similar to the EPA's Ecological Exposure Research Division (EERD) tool*

Description

Probit estimation similar to the EPA's Ecological Exposure Research Division (EERD) tool

Usage

```
ProbitEPA(toxData, retData = FALSE, showOutput = TRUE)
```

Arguments

`toxData`	numeric matrix, matrix with concentration, n ,r columns
`retData`	logic, return the results in a list
`showOutput`	logic, show results in the console

Value

Probit estimation regression

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`ProbitFiducialLimits` *Probit Fiducial Limits*

Description

Probit Fiducial Limits

Usage

```
ProbitFiducialLimits(Vm, m, tPercent = 5, roundFinney = FALSE)
```

Arguments

Vm	numeric, variance of the logarithm
m	numeric, logLD50
tPercent	numeric, probability level
roundFinney	logic, round as in Finney's book

Value

Probit Fiducial Limits

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

ProbitFinney *Probit estimation regression with Finney's method*

Description

Probit estimation regression with Finney's method

Usage

```
ProbitFinney(toxData, tPercent = 5, showPlot = FALSE, roundFinney = FALSE)
```

Arguments

toxData	numeric matrix, matrix with concentration, n ,r columns
tPercent	numeric, probability level
showPlot	logic, show regression line - plot
roundFinney	logic, round as in Finney's book

Value

Probit estimation regression

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

`ProbitRegression` *Probit regression line*

Description

Probit regression line

Usage

```
ProbitRegression(x, n, r, adjAbbot = FALSE, roundFinney = FALSE)
```

Arguments

`x`	numeric, log concentration
`n`	numeric, number of insects
`r`	numeric, number of observed affected
`adjAbbot`	logic, use Abbot adjustment
`roundFinney`	logic, round as in Finney's book

Value

Probit regression line a+bx

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`ProbitStandardErrorOfDosage` *Standard Error of dosage*

Description

Standard Error of dosage

Usage

```
ProbitStandardErrorOfDosage(varianceDosage)
```

Arguments

`varianceDosage`	numeric, Variance of dosage

Value

Standard Error of dosage

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`ProbitStandardErrorRate` *Standard Error of rate of increase of probit value per unit increase in x*

Description

Standard Error of rate of increase of probit value per unit increase in x

Usage

```
ProbitStandardErrorRate(n, w, x, xbar)
```

Arguments

n	numeric, number of insects
w	numeric, weighting coefficients
x	numeric, log concentration
xbar	numeric, mean dosage

Value

Standard Error of rate of increase of probit value per unit increase in x

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

ProbitToPercentage *Convert Probit values to percentages*

Description

Converts Probit values to percentages

Usage

```
ProbitToPercentage(myprobit)
```

Arguments

myprobit	numeric vector

Value

percentages

Author(s)

Jose Gama

References

Statistical tests for significance, accessed October 2015 http://archive.bio.ed.ac.uk/jdeacon/statistics/tress4.html

Examples

```
a<-c(.1,.5,1:10,50,96,97,98,99.5,99.99,99.999,99.9999)
b<-PercentageToProbit(a)
d<-ProbitToPercentage(b)
```

ProbitVALUEg *Probit value "g"*

Description

Probit value "g"

Usage

```
ProbitVALUEg(b, n, w, x, xbar, tPercent)
```

Arguments

b	numeric, rate of increase of probit value per unit increase in x
n	numeric, number of insects
w	numeric, weighting coefficients
x	numeric, log concentration
xbar	numeric, mean dosage
tPercent	numeric, probability level

Value

Probit value "g"

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

ProbitVarianceDosage *Variance of dosage*

Description

Variance of dosage

Usage

```
ProbitVarianceDosage(b, m, n, w, x, xbar)
```

Arguments

b	numeric, rate of increase of probit value per unit increase in x
m	numeric, dosage
n	numeric, number of insects
w	numeric, weighting coefficients
x	numeric, log concentration
xbar	numeric, mean dosage

Value

Variance of dosage

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

ProbitVarianceRate *Variance of rate of increase of probit value per unit increase in x*

Description

Variance of rate of increase of probit value per unit increase in x

Usage

```
ProbitVarianceRate(n, w, x, xbar)
```

Arguments

n	numeric, number of insects
w	numeric, weighting coefficients
x	numeric, log concentration
xbar	numeric, mean dosage

Value

Variance of rate of increase of probit value per unit increase in x

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

Probitw *Calculate weighting coefficient from expected probit*

Description

Returns the weighting coefficient from expected probit

Usage

```
Probitw(Y, C = 0)
```

Arguments

Y	numeric, expected probit
C	numeric, proportion of natural mortality

Value

the weighting coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press. Formula 6.3.

Examples

```
# Example from page 90 of Finney 1964:
# expected probit Y = 6.2, control mortality C = 59%
Y <- 6.2
C <- 0.59
# weighting coefficient = 0.141
Probitw(Y,C)
```

ProbitWeightingCoef *Calculate the weighting coefficient*

Description

Returns the weighting coefficient

Usage

```
ProbitWeightingCoef(Z, Q, P, C)
```

Arguments

Z	numeric, ordinate to the normal distribution corresponding to the probability P
Q	numeric, 1-P
P	numeric, Probability P of expected probit
C	numeric, proportion of natural mortality

Value

the weighting coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press. Formula 6.3.

Examples

```
# Example from page 90 of Finney 1964:
# expected probit Y = 6.2, control mortality C = 59%
Y <- 6.2
C <- 0.59
P <- pnorm(Y-5)
Q <- 1-P
Z <- ProbitZ(Y)
```

```
# weighting coefficient = 0.141
ProbitWeightingCoef(Z,Q,P,C)
```

ProbitWorkingP *Calculate working probit*

Description

Returns the working probit

Usage

```
ProbitWorkingP(Y, p)
```

Arguments

Y	numeric, expected probit
p	numeric, kill percentage

Value

the working probit

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
# Example from page 50 of Finney 1964:
# kill p = 72.3%, expected probit Y = 6.2
Y <- 6.2
p <- 72.3/100
# working probit = 5.366
ProbitWorkingP(Y,p)
```

ProbitZ — *Calculate the ordinate to the normal distribution corresponding to the probability P*

Description

Returns the ordinate to the normal distribution corresponding to the probability P

Usage

```
ProbitZ(Y)
```

Arguments

Y	numeric, expected probit

Value

the ordinate to the normal distribution corresponding to the probability P

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press. Formula 3.5.

Examples

```
# expected probit Y = 6.2
Y <- 6.2
ProbitZ(Y)
```

ProbitZ4dec — *Calculate the ordinate to the normal distribution corresponding to the probability P, exactly like Finney's*

Description

Returns the ordinate to the normal distribution corresponding to the probability P with the exact same results as Finney's

Usage

```
ProbitZ4dec(Y)
```

Arguments

Y	numeric, expected probit

Value

the ordinate to the normal distribution corresponding to the probability P

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press. Formula 3.5.

Examples

```
# expected probit Y = 6.2
Y <- 6.2
ProbitZ4dec(Y)
```

ScaleArcher *Archer Scale for assessment of leaf damage*

Description

Archer Scale for assessment of leaf damage

Usage

```
ScaleArcher(percentAffected)
```

Arguments

percentAffected	numeric vector

Value

Archer Scale for assessment of leaf damage

Author(s)

Jose Gama

References

Archer, T.L., 1987 Techniques for screening maize for resistance to mites. pp.178-183. In: Mihn, J.A., Wiseman, B.R. and Davis, F.M. (Eds.). Proceedings of the International symposium on methodologies for developing host plant resistance to maize insects. CIMMYT, Mexico.

`ScaleGauhlStover` *Gauhl's modification of Stover's severity scoring system*

Description

Gauhl's modification of Stover's severity scoring system

Usage

```
ScaleGauhlStover(percentShowingSymptoms)
```

Arguments

`percentShowingSymptoms`
: numeric, proportion of the leaf area showing symptoms

Value

Gauhl-Stover scale

Author(s)

Jose Gama

References

Gauhl F., 1994 Epidemiology and ecology of black Sigatoka (Mycosphaerella fijiensis Morlet) on plantain and banana (Musa spp.) in Costa Rica, Central America. INIBAP, Montpellier, France. 120pp).

ScaleHorsfallBarratt *Horsfall-Barratt Scale for Measuring Plant Disease*

Description

Horsfall-Barratt Scale for Measuring Plant Disease

Usage

```
ScaleHorsfallBarratt(percentAffected)
```

Arguments

percentAffected	numeric vector

Value

Horsfall-Barratt Scale for Measuring Plant Disease

Author(s)

Jose Gama

References

Horsfall, J. G.; Barratt, R. W., 1945 An Improved Grading System for Measuring Plant Disease. Phytopathology.

SheepsheadMinnow40SK *Mortality data from a fathead minnow larval survival and growth test (40 organisms per concentration)*

Description

Mortality data from a fathead minnow larval survival and growth test (40 organisms per concentration)

Usage

```
SheepsheadMinnow40SK
```

Details

Mortality data from a fathead minnow larval survival and growth test - data columns

- Concentration. Concentration.
- Mortality. Mortality

Author(s)

Jose Gama

References

USEPA, 2002 Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. 4th Edition,USEPA,Office of Water,October 2002,EPA 821-R-02-013 TABLE J1. pp 312

SpearmanKarber *Spearman Karber estimation*

Description

Spearman Karber estimation

Usage

```
SpearmanKarber(toxData, N, retData = FALSE, showOutput = TRUE,
  showPlot = TRUE)
```

Arguments

toxData	numeric matrix, matrix with concentration, n ,r columns
N	numeric, number of organisms
retData	logic, return the results in a list
showOutput	logic, show results in the console
showPlot	logic, show regression line - plot

Value

Spearman Karber estimation

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

`Table1Finney1964` *Transformation of Percentages to Probits, table I of Finney, 1964*

Description

Transformation of Percentages to Probits, table I of Finney, 1964

Usage

```
Table1Finney1964
```

Details

Transformation of Percentages to Probits - data columns

- Percentage. Percentage.
- Col0.0. Column for 0.0
- Col0.1. Column for 0.1
- Col0.2. Column for 0.2
- Col0.3. Column for 0.3
- Col0.4. Column for 0.4
- Col0.5. Column for 0.5
- Col0.6. Column for 0.6
- Col0.7. Column for 0.7
- Col0.8. Column for 0.8
- Col0.9. Column for 0.9

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Table2Finney1964 *The Weighting Coefficient and Q/Z, table II of Finney, 1964*

Description

The Weighting Coefficient and Q/Z, table II of Finney, 1964

Usage

```
Table2Finney1964
```

Details

The Weighting Coefficient and Q/Z - data columns

- Y. expected probit
- Q/Z.
- C=0. 0
- C=1. 1 ...
- C=89. 89
- C=90. 90

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Table3Finney1964 *Maximum and Minimum working probits and Range, table III of Finney, 1964*

Description

Maximum and Minimum working probits and Range, table III of Finney, 1964

Usage

```
Table3Finney1964
```

Details

Maximum and Minimum working probits and Range - data columns

- Ymin. Minimum working probit - expected
- Y0. Minimum working probit - Y0 = Y-P/Z
- Yrange. Range 1/Z
- Y100. Maximum working probit - Y100 = Y+Q/Z
- Ymax. Maximum working probit - expected

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

`Table4Finney1964` *Working probits, table IV of Finney, 1964*

Description

Working probits, table IV of Finney, 1964

Usage

```
Table4Finney1964
```

Details

Working probits - data columns

- Kill
- Col2 Expected probit 2.0
- Col2.1 Expected probit 2.1 ...
- Col7.8 Expected probit 7.8
- Col7.9 Expected probit 7.9

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Table5Finney1964 — *The Probability, P, the Ordinate, Z, and Z^2, table V of Finney, 1964*

Description

Probability, P, the Ordinate, Z, and Z^2, table V of Finney, 1964

Usage

```
Table5Finney1964
```

Details

The Probability, P, the Ordinate, Z, and Z^2 - data columns

- Y. Expected probit
- P. Probability P of expected probit
- Z. Ordinate to the normal distribution corresponding to the probability P
- Z^2. Z^2

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Table8Finney1964 — *The Weighting Coefficient in Wadley's Problem, table VIII of Finney, 1964*

Description

The Weighting Coefficient in Wadley's Problem, table VIII of Finney, 1964

Usage

```
Table8Finney1964
```

Details

The Weighting Coefficient in Wadley's Problem - data columns

- Y. Expected probit
- w. Weighting Coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

---

`Table9Finney1964` *Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling, table IX of Finney, 1964*

Description

Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling, table IX of Finney, 1964

Usage

```
Table9Finney1964
```

Details

Minimum Working Probit, Range, and Weighting Coefficient for Inverse Sampling - data columns

- Y. Expected probit
- MinWorkProbit. Minimum working probit
- Range. Range 1/Z
- WeightingCoef. Weighting Coefficient

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

TestMix2poisons — *Generate table 26 from Finney1964 "The Function for Planning Tests of Mixtures of Two Poisons"*

Description

Generates table 26 from Finney1964 "The Function for Planning Tests of Mixtures of Two Poisons"

Usage

```
TestMix2poisons()
```

Value

table 26 from Finney1964 "The Function for Planning Tests of Mixtures of Two Poisons"

- rho. toxicity
- 0.1. distance 0.1 log rho in the left of the probit regression line ...
- 0.9. distance 0.9 log rho in the left of the probit regression line

Author(s)

Jose Gama

References

Finney D. J., 1964 Probit analysis: a statistical treatment of the sigmoid response curve. Cambridge University Press

Examples

```
TestMix2poisons()
```

TSK — *Trimmed Spearman-Karber method, as per Hamilton and EPA*

Description

Returns the Trimmed Spearman-Karber (TSK) method, as per Hamilton and EPA

Usage

```
TSK(x, r, n, A = 0, conf = 0.95)
```

Arguments

x	numeric vector
r	numeric vector
n	numeric vector
A	numeric vector
conf	numeric vector

Value

mu=mu,gsd=gsd,left=left,right=right

Author(s)

Jose Gama

References

Hamilton,M.A.,Russo,R.L.,Thurston,R.V.,1977. Trimmed Spearman–Karber method for estimating median lethal concentrations. Environ. Sci. Tech. 11,714–719.

Examples

```
x<-c(15.54,20.47,27.92,35.98,55.52)
n1<-c(20,20,20,19,20)
r<-c(0,0,0,5.26,100)/100*n1
n<-c(20,20,20,19,20)
TSK(x,r,n)
```

WAAPPpestCount *WAAPP Pest Count scoring system*

Description

WAAPP Pest Count scoring system

Usage

```
WAAPPpestCount(percentLeafDamage)
```

Arguments

percentLeafDamage	numeric, percentage of leaf damage

Value

WAAPP Pest Count Score

Author(s)

Jose Gama

References

Environmental Protection Agency Chemicals Control And Managemenet Centre (ACCRA), 2012 Protocols for the biological evaluation of pesticides on Selected crops grown in both the humid and sahel regions of West africa. West Africa Agriculture Productivity Programme (WAAPP).

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