

Package ‘petitr’

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Title Relative Growth Rate

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Depends R (>= 1.8.0)

Description Calculates the relative growth rate (RGR) of a series of individuals by building a life table and solving the Lotka-Birch equation. (See Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. - Journal of Animal Ecology 17: 15-26) <doi:10.2307/1605>.

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grodata

"Big" life table with 100 individuals

Description

a life table with 100 individuals to test the time required by jackknife estimation

Usage

```
data(grodata)
```

Format

A data frame with 100 observations on the following 22 variables.

V1 fecundity of day 1
V2 fecundity of day 2
V3 fecundity of day 3
V4 fecundity of day 4
V5 fecundity of day 5
V6 fecundity of day 6
V7 fecundity of day 7
V8 fecundity of day 8
V9 fecundity of day 9
V10 fecundity of day 10
V11 fecundity of day 11
V12 fecundity of day 12
V13 fecundity of day 13
V14 fecundity of day 14
V15 fecundity of day 15
V16 fecundity of day 16
V17 fecundity of day 17
V18 fecundity of day 18
V19 fecundity of day 19
V20 fecundity of day 20
V21 fecundity of day 21
V22 fecundity of day 22

Details

fictional data designed to check the time needed and the effect of the m parameter of the jackknife estimation

Source

J.S. Pierre, fictitious

Examples

```
data(grosdata)
petitr(grosdata)
```

life	<i>life table for ten individuals</i>
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Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life)
```

Format

A data frame with 10 observations on the following 11 variables.

X1 numeric vector, age
X2 numeric vector, first individual
X3 numeric vector, second individual
X4 numeric vector, ...
X5 numeric vector, ...
X6 numeric vector, ...
X7 numeric vector, ...
X8 numeric vector, ...
X9 numeric vector, ...
X10 numeric vector, ...
X11 numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life)
petitr(life)
```

life1	<i>life table for ten individuals</i>
-------	---------------------------------------

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life1)
```

Format

A data frame with 10 observations on the following 11 variables.

X1 numeric vector, age

X2 numeric vector, first individual

X3 numeric vector, second individual

X4 numeric vector, ...

X5 numeric vector, ...

X6 numeric vector, ...

X7 numeric vector, ...

X8 numeric vector, ...

X9 numeric vector, ...

X10 numeric vector, ...

X11 numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

life2	<i>life2 table for ten individuals</i>
-------	--

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life2)
```

Format

A data frame with 10 observations on the following 11 variables.

X1 numeric vector, age

X2 numeric vector, first individual

X3 numeric vector, second individual

X4 numeric vector, ...

X5 numeric vector, ...

X6 numeric vector, ...

X7 numeric vector, ...

X8 numeric vector, ...

X9 numeric vector, ...

X10 numeric vector, ...

X11 numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

`life3`*life3 table for ten individuals*

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life3)
```

Format

A data frame with 10 observations on the following 11 variables.

X1 numeric vector, age

X2 numeric vector, first individual

X3 numeric vector, second individual

X4 numeric vector, ...

X5 numeric vector, ...

X6 numeric vector, ...

X7 numeric vector, ...

X8 numeric vector, ...

X9 numeric vector, ...

X10 numeric vector, ...

X11 numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

petitr *Per capita growth rate from individual data*

Description

calculates the per capita growth rate of a series of individuals through the set of individual life tables

Usage

```
petitr(tabvie, niter = 100, eps = 1e-07, m = 1, alpha = 0.05, s = 1)
```

Arguments

tabvie	A data.frame with a first column recording the endpoint of age classes, and as many columns as individuals. For each individual, each row represents the number of offspring produced by the individual between age $x-1$ and age x . After death or after the end of reproductive life, each column must be filled by zeros . The last row represents therefore the maximum reproductive age observed in the data set. The number of columns is $n+1$, where n is the number of individuals.
niter	the maximum number of iterations for the Newton's method. Default is 100
eps	Precision required for the Newton's method. Default is $1e-07$.
m	Size of the subsamples to drop one after one in the Jackknife method. Default is $m=1$. Any other value must divide exactly n , the number of individuals.
alpha	First kind error risk. Default is $\alpha=0.05$.
s	ex ratio expressed as the proportion of females in the total population. Default is 1, meaning a parthenogenetic population (ex. aphids). For a sexual population one would often set $s=0.5$.

Details

Calls `r`, and `x1xmx`, called by `ranova`.

Value

a vector with the pseudovalues of `r` calculated by the jackknife method

Author(s)

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References

Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. - Journal of Animal Ecology 17: 15-26. Lotka, A. (1924). Elements of mathematical biology. Reprinted 1956 by Dover Publications Inc., New York, USA.

See Also

[r](#), and [xlxmx](#), called by [ranova](#)

Examples

```
data(life)
petitr(life)
```

r

malthusian parameter

Description

Calculates the intrinsic rate of increase by solving the Birch equation. Uses the Newton method.

Usage

```
r(tab, eps = eps, maxiter = 100)
```

Arguments

tab	a data.frame with three columns : x, the age, lx, the proportion of survivors at age x, mx, the offspring number per individual in the age class x
eps	Precision for the convergence of Newton method. Default is object eps transmitted by the calling function r. must be defined for a standalone use
maxiter	maximum number of iterations for the Newton's method. default = 100

Value

a single numeric value : r

Author(s)

Jean-Sebastien PIERRE

References

Lotka 1924, Birch 1948.

See Also

[petitr](#), [xlxmx](#), [ranova](#)

Examples

```
data (tblif)
r(tblif,eps=0.000001)
```

ranova

Analysis of Variance on per capita growth rate pseudovalues

Description

Accepts as input a series (list) of individual life tables (see [r](#), [petitr](#), [life1](#)), calculates the Jack-knife estimator of r (per capita growth rate) on each table, and achieves a one way analysis of variance on the set of pseudovalues corresponding to each table.

Usage

```
ranova(listab, levels = NULL)
```

Arguments

<code>listab</code>	list of life tables. must be of class list, and each table of class data.frame
<code>levels</code>	a character vector giving level names for each life table. If NULL, the levels are named l1,l2, etc..

Value

a data frame with two columns: the set of pseudovalues, and a factor named pop. Can be retrieved and used for more sophisticated factor organisation

Author(s)

Jean-Sebastien Pierre

References

Lotka 1924, Birch 1948, Wratten 1982

See Also

[r](#), and [xlxmx](#), called by [petitr~](#)

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

tblif *population life table*

Description

a population life table with three columns, x, lx, mx (See below)

Usage

```
data(tblif)
```

Format

A data frame with 10 observations on the following 3 variables.

x a numeric vector, age

lx a numeric vector, Proportion of survivors at age x

mx a numeric vector, mean number of offspring produced in the age class x

Details

x must represent equal age classes in ascending order

Source

Application of the function [xlxmx](#) on the data set [life](#)

Examples

```
data(tblif)
r(tblif, eps=10e-08)
```

xlxmx *builds an average life table from a set of individuals*

Description

Calculates a life table with three columns, x, lx mx from the age specific birth data of a set of individuals. Called by `petitr`, but may be used as standalone function.

Usage

```
xlxmx(X, s)
```

Arguments

x a data.frame. See *petitr*
s Sex ratio expressed as the proportion of females in the population

Value

a data.frame with three columns, *x* (age), *lx* (survival at age *x*), *mx* (birth rate at age *x*)

Author(s)

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References

Lotka 1924, Birch 1948

See Also

[r](#), and [petitr](#), called by [ranova](#)

Examples

```
data(life)
tablif=xllmx(life,s=1)
```

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