

Package ‘pamm’

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Type Package

Title Power analysis for random effects in mixed models

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Description Simulation functions to assess or explore the power of a dataset to estimates significant random effects (intercept or slope) in a mixed model. The functions are based on the “lme4” package.

License GPL (>= 2)

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LazyLoad yes

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pamm-package

Power analysis for random effects in mixed models

Description

Description: Simulation functions to assess or explore the power of a dataset to estimates significant random effects (intercept or slope) in a mixed model. The functions are based on the "lme4" package.

Details

Package: pamm
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LazyLoad: yes

Author(s)

Julien Martin

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References

Martin, Nussey, Wilson and Reale Submitted Measuring between-individual variation in reaction norms in field and experimental studies: a power analysis of random regression models. *Methods in Ecology and Evolution*.

See Also

[EAMM](#), [SSF](#), [PAMM](#)

EAMM

Simulation function for exploratory power analysis for random effects

Description

Given a specific sample size (fixed number of group and replicates per group), the function simulate different variance-covariance structure and assess p-values and power of random intercept and random slope.

Usage

```
EAMM(numsim, group, repl, fixed = c(0, 1, 0), VI = seq(0.05, 0.95, 0.05),
      VS = seq(0.05, 0.5, 0.05), CoIS = 0, relIS = "cor", intercept = 0)
```

Arguments

<code>numsim</code>	number of simulation for each step
<code>group</code>	number of group (individuals)
<code>repl</code>	number of replicates (observations) per group
<code>fixed</code>	vector of length 3 with mean, variance and estimate of fixed effect to simulate. Default: <code>c(0,1,0)</code>
<code>VI</code>	variance component of intercept (ID). Could be specified as a vector. default value: <code>seq(0.05,0.95,0.05)</code>
<code>VS</code>	variance component of slope (ID*fixed effect interaction). Could be specified as a vector. Default: <code>seq(0.05,0.5,0.05)</code>
<code>CoIS</code>	value of correlation or covariance between random intercept and random slope. Default: 0
<code>relIS</code>	"cor" or "cov" set the type of relation give in CoIS. By default the relation is set to correlation
<code>intercept</code>	a numeric value giving the expected intercept value. Default: 0

Details

P-values for random effects are estimated using a log-likelihood ratio test between two models with and without the effect. Power represent the percentage of simulations providing a significant p-value for a given random structure. Residual variance (e) is calculated as $1-VI$.

Value

data frame reporting estimated P-values and power with CI for random intercept and random slope

Warning

the simulation is based on a balanced data set with unrelated group

Author(s)

Julien Martin

References

...

See Also

[PAMM](#), [SSF](#), [plot.EAMM](#)

Examples

```
## Not run:
ours=EAMM(numsim=10,group=10, repl=4, fixed=c(0, 1, 1), VI=seq(0.05, 0.3, 0.05),
          VS=seq(0.05, 0.2, 0.05))
plot(ours, "both")

## End(Not run)
```

PAMM

*Simulation function to assess power of mixed models***Description**

Given a specific variance-covariance structure for random effect, the function simulate different group size and assess p-values and power of random intercept and random slope

Usage

```
PAMM(numsim, group, repl, randompart, fixed = c(0, 1, 0), intercept = 0)
```

Arguments

numsim	number of simulation for each step
group	number of group (individuals). Could be specified as a vector
repl	number of replicates (observations) per group . Could be specified as a vector
randompart	vector of length 4 or 5, with 1) variance component of intercept (VI); 2) variance component of slope (VS); 3) residual variance (VR); 4) relation between random intercept and random slope; 5) "cor" or "cov" determine if the relation 4) between I and S is a correlation or a covariance (set to correlation by default)
fixed	vector with mean, variance and estimate of fixed effect to simulate. c(0,1,0) by default
intercept	a numeric value giving the expected intercept value. Default:0

Details

P-values for random effects are estimated using a log-likelihood ratio test between two models with and without the effect. Power represent the percentage of simulations providing a significant p-value for a given random structure

Value

data frame reporting estimated P-values and power with CI for random intercept and random slope

Warning

the simulation is based on a balanced data set with unrelated group

Author(s)

Julien Martin

References

...

See Also[EAMM](#), [SSF](#), [plot.PAMM](#)**Examples**

```
## Not run:
ours=PAMM(numsim=10,group=c(seq(10,50,10),100),repl=c(2,4,6),
          randompart=c(0.4,0.1,0.5,0.1),fixed=c(0,1,0.7))
plot(ours,"both")

## End(Not run)
```

plot.EAMM

*Graphic output of the EAMM function***Description**

provide graphic interpretation of the simulation results

Usage

```
## S3 method for class 'EAMM':
plot(x, graphtype = "both", vi, vs,...)
```

Arguments

x	an EAMM object
graphtype	"VI", "VS","both" or "both.dyn" "VI" give graphs with varying variance component of intercept and with a fixed variance component for slope (should be specified in vs) "VS" give graphs with varying variance component for slope and with a fixed variance component of intercept (should be specified in vi) "both" 3-D plot using lattice package "both.dyn" 3D plot using rgl package
vi	VI for which plots the output (necessary for "VS" type of graph)
vs	VS for which plots the output (necessary for "VI" type of graph)
...	potentially further arguments to pass to methods

Author(s)

Julien Martin

See Also

[EAMM](#), [plot.PAMM](#), [plot.SSF](#)

Examples

```
## Not run:
ours=EAMM(numsim=10,group=10,repl=4,VI=seq(0.05,0.95,0.05),VS=c(0.05,0.1))
plot(ours, "both")
plot(ours, "VI",vi=0.4)
plot(ours,"VS",vs=0.1)

## End(Not run)
```

plot.PAMM

Graphic output of the PAMM function

Description

provide graphic interpretation of the simulation results

Usage

```
## S3 method for class 'PAMM':
plot(x, graphtype = "both", nbgroup, nbrepl,...)
```

Arguments

x	a PAMM object
graphtype	"group", "repl", "both" or "both.dyn" "group" give graphs with varying number of ID and with a fixed number of replicates (should be specified in nbrepl) "repl" give graphs with varying number of replicates and with a fixed number of ID (should be specified in nbgroup) "both" 3-D plot using lattice package (useful only with multiple group size and multiple number of replicates) "both.dyn" 3D plot using rgl package (useful only with multiple group size and multiple number of replicates)
nbgroup	number of group for which plots the output (necessary for "repl" type of graph)
nbrepl	number of replicates for which plots the output (necessary for "group" type of graph)
...	potentially further arguments to pass to methods

Author(s)

Julien Martin

See Also

[PAMM](#), [plot.EAMM](#), [plot.SSF](#)

Examples

```
## Not run:
ours=PAMM(numsim=10,group=c(10,20,30),repl=c(2,4,6),randompart=c(0.4,0.1,0.5,0.1),fixed=c(
plot(ours, "both")
plot(ours, "group",nbrepl=4)
plot(ours, "repl",nbgroup=20)

## End(Not run)
```

plot.SSF

Graphic output of the PAMM function

Description

provide graphic interpretation of the simulation results

Usage

```
## S3 method for class 'SSF':
plot(x, ...)
```

Arguments

x an SSF object
... potentially further arguments to pass to methods

Author(s)

Julien Martin

See Also

[SSF](#), [plot.PAMM](#), [plot.EAMM](#)

Examples

```
## Not run:
oursSSF=SSF(50,100,10,c(0.4,0.1,0.6,0))
plot(oursSSF)

## End(Not run)
```

SSF

*Simulation function to assess power of mixed models***Description**

Given a specific total number of observations and variance-covariance structure for random effect, the function simulates different association of number of group and replicates (giving the specified sample size) and assess p-values and power of random intercept and random slope

Usage

```
SSF(numsim, tss, nbstep = 10, randompart, fixed = c(0, 1, 0), intercept = 0, exgr =
```

Arguments

<code>numsim</code>	number of simulation for each step
<code>tss</code>	total sample size (nb group * nb replicates)
<code>nbstep</code>	number of group*replicates associations to simulate
<code>randompart</code>	vector of length 4 or 5 with 1) variance component of intercept (VI); 2) variance component of slope (VS); 3) residual variance (VR); 4) relation between random intercept and random slope; 5) "cor" or "cov" determine if the relation between I and S is correlation or covariance (set to correlation by default)
<code>fixed</code>	vector of length 3 with mean, variance and estimate of fixed effect to simulate
<code>intercept</code>	a numeric value giving the expected intercept value. Default:0
<code>exgr</code>	a vector specifying minimum and maximum value for number of group. Default:c(2,tss/2)
<code>exrepl</code>	a vector specifying minimum and maximum value for number of replicates. Default:c(2,tss/2)

Details

P-values for random effects are estimated using a log-likelihood ratio test between two models with and without the effect. Power represent the percentage of simulations providing a significant p-value for a given random structure

Value

data frame reporting estimated P-values and power with CI for random intercept and random slope

Warning

the simulation is based on a balanced data set with unrelated group

Author(s)

Julien Martin

References

...

See Also[PAMM](#), [EAMM](#), [plot.SSF](#)**Examples**

```
## Not run:  
ours<- SSF(100,200,10,c(0.4,0.1,0.6,0))  
plot(ours)  
  
## End(Not run)
```

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