Package 'samplingDataCRT'

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Type Package

Title Sampling Data Within Different Study Designs for Cluster Randomized Trials

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Description Package provides the possibility to sampling complete datasets from a normal distribution to simulate cluster randomized trails for different study designs.

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RoxygenNote 5.0.1

Imports mvtnorm, stats

Suggests knitr, rmarkdown, lme4

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

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R topics documented:

blockMatrixDiagonal *diagonal block matrix*

Description

create a diagonal block matrix

Usage

```
blockMatrixDiagonal(...)
```

Arguments

...	a list of matrices

Value

diagonal block matrix concatinated from this list of matrices

Examples

```
m1<-matrix(round(runif(4*4),1),nrow=4,ncol=4)
m2<-matrix(round(runif(4*4),1),nrow=4,ncol=4)
blockMatrixDiagonal(m1,m2,m2,m1)

sigma.1<-0.1
sigma.2<-0.4
J<-10 #subjects
I<-3 #cluster
V.i<-sigma.2*matrix(1,nrow=J,ncol=J)+sigma.1*diag(1, nrow=J,ncol=J) #Covarianmatrix of one cluster
x<-lapply(1:I, function(X) V.i)
blockMatrixDiagonal(x) #Covarianmatrix of all cluster
```

calcPower.SWD *Power calculation within stepped wedge design model by Hussey et.al or Heo&Kim*

Description

Calculation of power for a lmm with cluster as random effect, fixed timepoint effects, but set to null, TP number of timepoints, I number of cluster. The design matrix has to be coded by zeros and ones.

Usage

```
calcPower.SWD(ThetaEst, alpha = 0.05, Design, sigmaq, tauq,
  sigmaq.error = NULL, noSub = NULL, time = TRUE,
  type = "cross-sectional")
```

Arguments

ThetaEst	expected treatment effect
alpha	singificance level (by default 0.05)
Design	design matrix for a given SWD model
sigmaq	within cluster variance(between subject variance)
tauq	between cluster variance
sigmaq.error	within subject variance/error variance
noSub	number of subjects within each cluster and each timepoint (for all an equal size)
time	a logical (FALSE, if no time trends are expected, otherwise TRUE) is only relevant for evaluation of cross-sectional data
type	is of cross-sectional (by default) or longitudinal assigns the type of data (2 or 3 level nested structure)

Value

Aproximated power of two tailed test, although the design matrix is fractionated, then power is not valid formula used for cross-sectional data provided by Michael A. Hussey and James P. Hughes, Design and analysis of stepped wedge cluster randomized trials, Contemporary Clinical Trials(28),2007, and for longitudinal data by Heo M., Kim N., Rinke ML., Wylie-Rosett J., Sample size determinations for stepped-wedge clinical trials from a three-level data hierarchy perspective, Stat Methods Med Res., 2016

Examples

```
noCl<-10
noT<-6
switches<-2
DM<-designMatrix(noCl,noT,switches)
sigma.e <- 2
sigma.alpha <- 2
#Power for cross-sectional SWD design by formula of Hussey&Hughes
calcPower.SWD(ThetaEst=1,Design=DM, sigmaq=sigma.e^2, tauq=sigma.alpha^2, time=FALSE)
calcPower.SWD(ThetaEst=1,Design=DM, sigmaq=sigma.e^2, tauq=sigma.alpha^2, time=TRUE)
#Power for longitudinal SWD design by formula of Heo&Kim
DM.new<-NULL
for(i in 1:dim(DM)[2]){
DM.new<-cbind(DM.new,DM[,i], DM[,i])
}
s.e <- sqrt(7/10)
s <- sqrt(2/10)
s.a <- sqrt(1/10 )
K<- 10 #number of participants within each 'cell'
calcPower.SWD(ThetaEst=1, Design=DM.new, s.a^2, s^2, s.e^2, noSub=K, type="longitudinal")
```

completeDataDesignMatrix *Design matrix for complete data within design*

Description

create design matrix for complete data within design

Usage

```
completeDataDesignMatrix(J, X)
```

Arguments

J	number of subjects
X	given design matrix

Value

design matrix for complete data within design

Examples

```
K<-6  #measurement (or timepoints)
I<-10 #Cluster
J<-2 #number of subjects
X<-designMatrix(nC=I, nT=K, nSw=2)
completeDataDesignMatrix(J, X)
```

CovMat.Design *covariance matrix for the multivariate normal distributed variables*

Description

covariance matrix of the normal distribution under cluster randomized study type given a design and a type

Usage

```
CovMat.Design(K, J, I, sigma.1.q, sigma.2.q = NULL, sigma.3.q)
```

Arguments

K	number of timepoints or measurments (design parameter)
J	number of subjects
I	number of clusters (design parameter)
sigma.1.q	variance of the lowest level (error variance or within subject variance)
sigma.2.q	secound level variance (e.g. within cluster and between subject variance), by default NULL and then a cross-sectional type
sigma.3.q	third level variance (e.g. between cluster variance)

Value

V covariance matrix

Examples

```
K<-6  #measurement (or timepoints)
I<-10 #Cluster
J<-2 #number of subjects

sigma.1<-0.1
sigma.3<-0.9
CovMat.Design(K, J, I,sigma.1.q=sigma.1, sigma.3.q=sigma.3)

sigma.1<-0.1
sigma.2<-0.4
sigma.3<-0.9
CovMat.Design(K, J, I,sigma.1.q=sigma.1, sigma.2.q=sigma.2, sigma.3.q=sigma.3)
```

---

designMatrix *Design matrix for SWD model*

Description

create design matrix for a given setup of a stepped wedge design

Usage

```
designMatrix(nC, nT, nSw, swP = NULL, design = "SWD")
```

Arguments

nC	number of cluster
nT	number of timepoints
nSw	number of cluster : within parallel recieve the control (nC-nSw receive the intervention), within cross-over recieve the pattern (0, 1) (nC-nSw receive the pattern (1,0)) for nearly the same number of time points, within SWD switches from control to intervention per time point

swP	is the time point the cluster cross over the condition in a cross over study, if not given then it is nearly half of the time past
design	is the study type (parallel, cross-sectional, stepped wedge)

Value

design matrix for a given setup of a stepped wedge design

Examples

```
designMatrix(5,6,1)

K<-6  #measurement (or timepoints)
I<-10 #Cluster
designMatrix(nC=I, nT=K, nSw=2)
```

---

implemMatrix.SWD *Design matrix for SWD model under a grade of intervention implementation pattern*

Description

Creates a implementation matrix for a given stepped wedge design and grade of intervention implementation pattern

Usage

```
implemMatrix.SWD(nC, nT, nSw, pattern)
```

Arguments

nC	Number of clusters
nT	Number of timepoint
nSw	number of clusters switches from control to treatment at each timepoint
pattern	a vector for grade of intervention implementation pattern, which gives the derivation from 100 percent effectiveness over time

Value

Design matrix for SWD model under a grade of intervention implementation pattern

Examples

```
implemMatrix.SWD(5,6,1, c(seq(0.4,1,0.2),1))

K<-6  #measurement (or timepoints)
I<-10 #Cluster
implemMatrix.SWD(nC=I, nT=K, nSw=2, pattern=c(seq(0.4,1,0.2),1))
```

---

sampleData *Sampling Response of individuals within a SWD model*

Description

Sample data (response) for given numbers of individuals by given a model (of a parallel, cross-sectional, stepped wedge design study)

Usage

```
sampleData(type, K, J, I, D, A = NULL, V, parameters)
```

Arguments

type	of the design is either cross-sectional (cross-sec) or longitudinal (longitudinal)
K	number of timepoints or measurments (design parameter)
J	number of subjects
I	number of clusters (design parameter)
D	a complete data design matrix corresponding to the assumed model
A	a complete data design matrix corresponding to the true data, if A is null, then A is equal to D
V	covariance matrix for the normal distribution
parameters	corresponding to the model (regression fixed effects coefficients)

Value

Data of individuals intensities corresponds to the SWD model and full model parameter information

Examples

```
K<-6  #measurement (or timepoints)
I<-10 #Cluster
J<-2 #number of subjects
X<-designMatrix(nC=I, nT=K, nSw=2)
D<-completeDataDesignMatrix(J, X)
sigma.1<-0.1
sigma.3<-0.9
type<-"cross-sec"
```

```
V<-CovMat.Design(K, J, I, sigma.1=sigma.1, sigma.3=sigma.3)
mu.0<-0
theta<-1
betas<-rep(0, K-1)
parameters<-c(mu.0, betas, theta)
sample.data<-sampleData(type = type, K=K,J=J,I=I, D=D, V=V, parameters=parameters)
xtabs(~cluster+measurement, data=sample.data)
```

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