Package ‘CrossCarry’

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Type Package

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Author Nelson Alirio Cruz Gutierrez [aut, cre, cph],
Oscar Orlando Melo [aut],
Carlos Alberto Martinez [aut]

Maintainer Nelson Alirio Cruz Gutierrez <neacruzgu@una1.edu.co>

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Arterial pressure data of crossover design

Description

Data of a crossover experiment with three treatments to control arterial pressure: treatment A is a placebo, treatments B and C are 20 and 40 mg doses of a test drug. Thus, there were six three-period sequences: ABC, ACB, BCA, BAC, CAB and CBA, each one of them was applied to two individuals lasting six weeks each. Due to ethical reasons, there was no washout period between the treatments. In each period, 10 consecutive measurements of diastolic arterial pressure were taken: 30 and 15 minutes before, and 15, 30, 45, 60, 75, 90, 120 and 240 minutes after the administration of the treatment.

Usage

Arterial

Format

A data frame with 360 rows and 5 columns:

Subject The unique identifier of each of the patients
Period The period of application of each treatment
Treatment A is a placebo, treatments B and C are 20 and 40 mg doses of a test drug
Pressure diastolic arterial pressure
Time Measurement time

Source

createCarry

Add carryover dummy variables

Description
Create dummy variables associated with first-order carryover effect in a Crossover Design

Usage
createCarry(data, treatment, period, id, carrySimple = TRUE)

Arguments
- data: A data frame with the variables of the crossover experimental design
- treatment: A character string specifying the name of vector with the treatment applied at each observation of the crossover experimental design
- period: A character string specifying the name of vector with the observation period of the responses of the crossover experimental design
- id: A character string specifying the name of vector which identifies the experimental units.
- carrySimple: TRUE = simple carry-over, where the residual effect of a treatment affects equally each of the treatments that are preceded by it, and FALSE = carry-over complex, where the residual effect of the treatment affects each of the other treatments differently.

Value
- data: A data frame with all the variables of the crossover experimental design and the carryover variables
- carryover: The new carryover variables

Examples
```r
data(Water)
carryover <- createCarry(data=Water, 
                         treatment = "Treatment", id = "ID", 
                         period = "Period", carrySimple = FALSE)
carryover$carryover
carryover$data```
CrossGEE

Run a GEE model for data from a crossover experiment

Description

Provides a GEE model for the data of a crossover design with S sequences of T periods. There must be one observation of each experimental unit in each period.

Usage

CrossGEE(
  response,
  period,
  treatment,
  id,
  carry,
  covar = NULL,
  data,
  family = gaussian(),
  correlation = "independence",
  formula = NULL
)

Arguments

response A character string specifying the name of the response variable of the crossover experimental design
period A character string specifying the name of vector with the observation period of the responses of the crossover experimental design
treatment A character string specifying the name of vector with the treatment applied at each observation of the crossover experimental design
id A character string specifying the name of vector which identifies the experimental units. The length of ‘id’ should be the same as the number of observations. Data are assumed to be sorted so that observations on each cluster appear as contiguous rows in data. If data is not sorted this way, the function will not identify the clusters correctly. If data is not sorted this way, a warning will be issued.
carry A vector of character string specifying the name set of dummy variables that indicates the treatment applied in the previous period of each experimental unit. They must be 0 in period 1
covar A vector of character string specifying the name of possible covariates of the crossover experimental design
data A data frame with all the variables of the crossover experimental design
family See corresponding documentation to glm
correlation A character string specifying the correlation structure. The following are permitted: "independence", "exchangeable", "ar1" and "unstructured"
A formula related the response variable with the explanatory variables. If it is NULL, formula response~period+treatment+carry+covar will be evaluated.

Value

QIC The QIC of the models: The model are fitted by geeglm
model The model fitted by geeglm.

Examples

data(Water)
model <- CrossGEEKron(response="LCC", covar=c("Age"), period="Period",
treatment = "Treatment", id="ID", carry="Carry_Agua",
family=gaussian(),correlation ="ar1" ,data=Water)

model$QIC
model$model
summary(model$model)

CrossGEEKron Run a GEE model for data from a crossover experiment with repeated measures

Description

Provides a GEE model for the data of a crossover design with S sequences of T periods. There must be at least two observations of each experimental unit in each period.

Usage

CrossGEEKron(
    response, period, treatment, id, time, carry, covar = NULL, data,
    family = gaussian(), correlation = "independence", formula = NULL,
    tol = 1e-04, niter = 100
)
**Arguments**

- **response**: A character string specifying the name of the response variable of the crossover experimental design.
- **period**: A character string specifying the name of the vector with the observation period of the responses of the crossover experimental design.
- **treatment**: A character string specifying the name of the vector with the treatment applied at each observation of the crossover experimental design.
- **id**: A character string specifying the name of the vector which identifies the experimental units. The length of `id` should be the same as the number of observations. Data are assumed to be sorted so that observations on each cluster appear as contiguous rows in data. If data is not sorted this way, the function will not identify the clusters correctly. If data is not sorted this way, a warning will be issued.
- **time**: A character string specifying the name of the vector with the measurement time within each period.
- **carry**: A vector of character strings specifying the name set of dummy variables that indicates the treatment applied in the previous period of each experimental unit. They must be 0 in period 1.
- **covar**: A vector of character strings specifying the name of possible covariates of the crossover experimental design.
- **data**: A data frame with all the variables of the crossover experimental design.
- **family**: See corresponding documentation to `glm`.
- **correlation**: Character string specifying the correlation within periods structure. The following are permitted: "independence", "exchangeable", "ar1" and "unstructured".
- **formula**: A formula related the response variable with the explanatory variables. If it is NULL the formula, `response ~ period + treatment + carry + time + covar` will be evaluated.
- **tol**: The tolerance used in the fitting algorithm.
- **niter**: The maximum number of iterations. `response ~ period + treatment + carry + time + covar` will be evaluated.

**Value**

- **QIC**: The QIC of the model: The model are fitted by `geeglm`.
- **model**: The model fitted by `geeglm`.
- **Within**: The estimated correlation matrix within the period with the structure determined by `correlation`.
- **Between**: The estimated correlation matrix between periods.

**Source**

https://doi.org/10.1007/s00362-022-01391-z

**References**

Examples

data(Arterial)
carrydata <- createCarry(data=Arterial, treatment = "Treatment", period = "Period", id="Subject")
data <- carrydata$data
carry <- carrydata$carryover
model <- CrossGEEKron(response = "Pressure", treatment = "Treatment", period = "Period", id="Subject", time="Time", carry=c("Carry_B","Carry_C"),data=data, correlation = "ar1")
model$QIC
model$Within
model$Between
summary(model$model)

model2 <- CrossGEEKron(response = "Pressure", treatment = "Treatment", period = "Period", id="Subject", time="Time", carry=c("Carry_B","Carry_C"), data=data, correlation = "ar1", formula=Pressure ~ Treatment+ Period+ Carry_B+Carry_C)
model2$QIC
model2$Within
model2$Between
summary(model2$model)

CrossGEESP

Run a semi-parametric GEE model for data from a crossover experiment with repeated measures

Description

Provides a GEE model for the data of a crossover design with S sequences of T periods. There must be at least two observations of each experimental unit in each period. The effect of time within period and the possible carryover effects are modeled by means of splines.

Usage

CrossGEESP(
  response,
  period,
  treatment,
  id,
  time,
  carry,
  covar = NULL,
  data,
family = gaussian,
correlation = "independence",
formula = NULL,
tol = 1e-04,
niter = 100,
nodes = NULL
)

Arguments

response A character string specifying the name of the response variable of the crossover experimental design
period A character string specifying the name of vector with the observation period of the responses of the crossover experimental design
treatment A character string specifying the name of vector with the treatment applied at each observation of the crossover experimental design
id A character string specifying the name of vector which identifies the experimental units. The length of ‘id’ should be the same as the number of observations. Data are assumed to be sorted so that observations on each cluster appear as contiguous rows in data. If data is not sorted this way, the function will not identify the clusters correctly. If data is not sorted this way, a warning will be issued.
time A character string specifying the name of the vector with the measurement time within each period
carry A vector of character string specifying the name set of dummy variables that indicates the treatment applied in the previous period of each experimental unit. They must be 0 in period 1
covar A vector of character string specifying the name of possible covariates of the crossover experimental design
data A data frame with all the variables of the crossover experimental design
family See corresponding documentation to glm
correlation character string specifying the correlation within periods structure. The following are permitted: "independence", "exchangeable", "ar1" and "unstructured"
formula A formula related the response variable with the explanatory variables. If it is NULL, formula response~period+treatment+carry+time+covar will be evaluated.
tol the tolerance used in the fitting algorithm.
niter the maximum number of iterations.
nodes Number of nodes in the estimation of the splines. By default, the base 2 logarithm of the number of observations per period is used.

Value

QIC The QIC of the model: The model are fitted by geeglm
model The model fitted by geeglm.
graphs The graphs estimated by splines. In position 1 the graph of the effect of time appears and from then on, it appears one for each carryover effect declared in the carry option. The graphs are built with ggplot2, therefore they allow manipulation of axes and other graphic parameters of that library.

Source

https://doi.org/10.1177/09622802231158736

References

Cruz Gutierrez NA, Melo OO, Martinez CA. Semiparametric generalized estimating equations for repeated measurements in cross-over designs. Statistical Methods in Medical Research. 2023;0(0).

Examples

data(Arterial)
carrydata <- createCarry(data=Arterial, treatment = "Treatment", period = "Period",id="Subject", carrySimple = FALSE)
data <- carrydata$data
carry <- carrydata$carryover
model1 <- CrossGEESP(response = "Pressure", treatment = "Treatment", period = "Period", id="Subject", time="Time", carry=carrydata$carryover,data=data, correlation = "exchangeable")

model2 <- CrossGEESP(response = "Pressure", treatment = "Treatment", period = "Period", id="Subject", time="Time", carry=carrydata$carryover,data=data, correlation = "ar1")

model1$QIC
model2$QIC
summary(model1$model)
summary(model2$model)
model1$graph[[1]]
model1$graph[[2]]
plot <- model1$graph[[1]] + ggplot2::xlab("Time in minutes")+
        ggplot2::ylab("Change in systolic blood pressure")
plot
Description

A pilot study to investigate the impact of providing supplementary drinking water on the cognitive performance of pupils of two school grades (5 and 6) in water-scarce schools in rural Mali. 47 students were assigned to take the control treatment (normal conditions) on the first day and receive the treatment (controlled hydration) on the second day. 60 received the treatments in reverse (Hydration the first day and control the second day). One part of this test assesses visual attention. This test assesses visual attention. Pupils were given a grid containing target letters randomly dispersed among non-target letters and were given one minute to cross out as many target letters as possible. Scores were calculated by subtracting the number of non-target letters identified from the number of target letters identified; the maximum test score was 38.

Usage

Water

Format

A data frame with 214 rows and 10 columns:

- **ID** The unique identifier of each of the students
- **Age** The age in years of each of the students
- **LCS** Letter Cancel incorrect (raw score)
- **LCC** Letter Cancel correct (raw score)
- **LCI** Letter Cancel score (LCC-LCI)
- **sex** f=female, 1=male
- **school** school indicator A or B
- **Treatment** Condition indicator 0=Control 1=Water
- **Period** date of visit
- **Carry_Agua** Carry indicator 0=First period, 1=Water in the first period, -1 = Control in the first period

Source

<https://journals.plos.org/plosone/article/authors?id=10.1371/journal.pone.0210568>
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