Package 'mmm2'

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Type Package

Title Multivariate marginal models with shared regression parameters

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Depends gee

Description Fits multivariate marginal models with shared regression parameters for discrete and continuous responses

License GPL (>= 2)

NeedsCompilation no

Repository CRAN

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R topics documented:

`mmm2-package` *Multivariate marginal models with shared regression parameters*

Description

Includes a multivariate marginal model for which the formulation permits fitting models with shared and response specific regression parameters at the same time

Asar, O., Ilk, O. (2013). Flexible multivariate marginal models for analyzing multivariate longitudinal data, with applications in R. Submitted.

Details

Package:	mmm2
Type:	Package
Version:	1.2
Date:	2013-29-12
License:	GPL (>=2)

`Kenya_morbidity` *Kenya Morbidity Data Set*

Description

A bivariate longitudinal binary data set.

Usage

```
data(Kenya_morbidity)
```

Format

A data frame with 4692 observations on the following 7 variables.

`ID` a vector for subject ID

`poor_appetite` a vector for poor appetite: 0 = absence, 1 = presence

`headache` a vector for headache: 0 = absence, 1 = presence

`visit_num` a vector for follow-up time (in month)

`age_at_onset` a vector for age at onset (in years)

`boy` a vector for gender: 0 = girl, 1 = boy

`treatment` a vector for treatment: 0 = control, 1 = calorie, 2 = meat, 3 = milk

Details

This data set is a sample of the big data set available at the link below. Only children with full data for the first year were included.

Source

http://rem.ph.ucla.edu/mld/data/tabdelimiteddata/morbidity_class.txt

References

Neumann, C. G., Bwibo, N. O., Murphy, S. P., Sigman, M., Whaley, S., Allen, L. H., Guthrie, D., Weiss, R. E. Demment, M. W. (2003). Animal source foods improve dietary quality, micronutrient status, growth and cognitive function in Kenyan school children: Background, study design and baseline findings. *Journal of Nutrition*, **11**, 3491S–3949S.

Weiss, R. E. (2005). *Modeling longitudinal data*. Springer-Verlag, New York.

Examples

```
data(Kenya_morbidity)
head(Kenya_morbidity, 10)
summary(Kenya_morbidity$age_at_onset)
table(Kenya_morbidity$treatment)
```

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mlcd *Multivariate Longitudinal Count Data (MLCD)*

Description

A data frame with 2000 observations on the following 6 variables. MLCD is a simulated bivariate longitudinal count dataset assuming there are 500 subjects in the study whose data are collected at 4 equally-spaced time points.

Usage

```
data(mlcd)
```

Format

A data frame with 2000 observations on the following 6 variables.

`ID` a numeric vector for subject ID

`resp1` a numeric vector for the first longitudinal count response

`resp2` a numeric vector for the second longitudinal count response

`X` a numeric vector for the covariate, X

`time` a numeric vector for the time point at which observations are collected

`X.time` a numeric vector for the interaction between X and time

Details

The covariates, X and time are the standardized values indeed. The related interaction is calculated by using these standardized values. X is a time-independent covariate. For the details of data generation see the user manual of the R package mmm at http://cran.r-project.org/web/packages/mmm/index.html.

References

Asar, O. (2012). *On multivariate longitudinal binary data models and their applications in forecasting*. MS Thesis, Middle East Technical University. Available at http://www.lancaster.ac.uk/pg/asar/thesis-Ozgur-Asar.

Erhardt, V. (2009). corcounts: Generate Correlated Count Random Variable. R package version 1.4. URL http://CRAN.R-project.org/package=corcounts.

Examples

```
data(mlcd)
plot(mlcd$X,mlcd$resp1)
```

`mlgd` *Multivariate Longitudinal Continuous (Gaussian) Data (MLGD)*

Description

A data frame with 2000 observations on the following 6 variables. MLGD is a simulated bivariate longitudinal continuous dataset assuming there are 500 subjects in the study whose data are collected at 4 equally-spaced time points.

Usage

```
data(mlgd)
```

Format

A data frame with 2000 observations on the following 6 variables.

`ID` a numeric vector for subject ID

`resp1` a numeric vector for the first longitudinal count response

`resp2` a numeric vector for the second longitudinal count response

`X` a numeric vector for the covariate, X

`time` a numeric vector for the time point at which observations are collected

`X.time` a numeric vector for the interaction between X and time

Details

The covariates, X and time are the standardized values indeed. The related interaction is calculated by using these standardized values. X is a time-independent covariate. For the details of data generation see the user manual of the R package mmm at http://cran.r-project.org/web/packages/mmm/index.html.

References

Asar, O. (2012). *On multivariate longitudinal binary data models and their applications in forecasting*. MS Thesis, Middle East Technical University. Available at http://www.lancaster.ac.uk/pg/asar/thesis-Ozgur-Asar.

Genz, A., Bretz, F., Miwa, T., Mi, X., Leisch, F., Scheipl, F., Hothorn, T. (2011). mvtnorm: Multivariate Normal and t Distributions. R package version 0.9-96. URL http://CRAN.R-project.org/package=mvtnorm.

Examples

```
data(mlgd)
plot(mlgd$X,mlgd$resp1)
```

`mmm2` *Function to fit multivariate marginal models with shared regression parameters*

Description

fits multivariate marginal models with shared regression parameters for both continous and discrete responses

Usage

```
mmm2(formula, id, data = NULL, rtype = TRUE, interaction = NULL, R = NULL,
b = NULL, tol = 0.001, maxiter = 25, family = "gaussian", corstr = "independence",
Mv = 1, silent = TRUE, scale.fix = FALSE, scale.value = 1)
```

Arguments

`formula`	a formula expression, see the examples given below.
`id`	a vector for identification of the clusters or a single sided formula, see examples.
`data`	an optional data frame.
`rtype`	a logical variable which determines the inclusion of response type indicator variables as new covariates. The default is set to TRUE which corresponds to the inclusion of response types by placing them right after the last covariate in the design matrix. For k multiple responses, k-1 indicator variables are to be created and mmm2 has a systematic way of creating these variables: The first response takes 0 for all the k-1 indicator variables and jth response (j = 2, . . . , k) takes 1 only for the (k-j+1)th indicator variable and takes 0 otherwise.
`interaction`	expects a vector of integers which includes the column number of the covariates (by considering only the covariate matrix, not the whole data) which are to be interacted with the response type indicator variables. These interactions are added as new covariates right after the last response type indicator variable. If rtype is set to FALSE, mmm2 ignores interaction even if it is set to a vector of column numbers of some covariates.

R	a user specified square matrix for the working correlation matrix, appropriate when corstr="fixed".
b	user specified initials for the parameter estimates.
tol	the tolerance which specifies the convergency of the algorithm.
maxiter	the maximum number of iterations to be consumed by the algorithm.
family	an object which defines the link and variance function. The possible choices are same with the ones in the "gee" package. For details see the gee documentation. Note that family=binomial handles multivariate longitudinal binary data, family=poisson handles multivariate longitudinal count data, family=gaussian handles multivariate longitudinal (normal type) continous data and family=gamma handles multivariate longitudinal (gamma type) continous data.
corstr	a character string which defines the structure of the working correlation matrix. For details see the gee documentation.
Mv	specifies the lag value, e.g. specification of "corstr=AR-M" and "Mv=1" indicates AR(1).
silent	a logical variable which decides the print of the iterations.
scale.fix	
scale.value	

Details

The mmm2 function utilizes the gee package within.

Value

Returns an onject of the results. See the examples given below.

Note

This is the version 1.2 of this user documentation file.

Author(s)

Ozgur Asar, Ozlem Ilk

References

Asar, O. (2012). *On multivariate longitudinal binary data models and their applications in forecasting*. MS Thesis, Middle East Technical University. Available at http://www.lancaster.ac.uk/pg/asar/thesis_Ozgur

Asar, O., Ilk, O. (2013). mmm: an R package for analyzing multivariate longitudinal data with multivariate marginal models. *Computer Methods and Programs in Biomedicine*, **112** 649–654.

Ilk, O., Daniels, M. (2007). Marginalized transition random effects models for multivariate longitudinal binary data. *Canadian Journal of Statistics*, **35**, 105-123.

Liang, K. L., Zeger, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika*, **73**, 13-22.

Shelton, B. J., Gilbert, G. H., Liu, B., Fisher, M. (2004). A SAS macro for the analysis of multivariate longitudinal binary outcomes. *Computer Methods and Programs in Biomedicine*, **76**, 163-175.

Zeger, S. L., Liang, K. L. (1986). Longitudinal data analysis for discrete and continous outcomes. *Biometrics*, **42**, 121-130.

See Also

gee

Examples

```
## binary data application
data(Kenya_morbidity)
fit1 <- mmm2(cbind(poor_appetite, headache) ~ visit_num + age_at_onset + boy +
            as.factor(treatment), id = ~ ID, data = Kenya_morbidity, interaction = 1 : 6,
             family = binomial(link = logit), corstr = "unstructured")
summary(fit1)$coef

## count data application
data(mlcd)
fit2<-mmm2(formula=cbind(mlcd$resp1,mlcd$resp2)~mlcd$X+mlcd$time+
mlcd$X.time,id=mlcd$ID,rtype=TRUE,interaction=1:3,family=poisson,corstr="unstructured")
summary(fit2)$coef

## continuous data application
data(mlgd)
fit3<-mmm2(formula=cbind(mlgd$resp1,mlgd$resp2)~mlgd$X+mlgd$time+
mlgd$X.time,id=mlgd$ID,rtype=TRUE,interaction=1:3,family=gaussian,corstr="unstructured")
summary(fit3)$coef
```

Index