Package 'mixor'

June 14, 2018

Type Package

Title Mixed-Effects Ordinal Regression Analysis

Version 1.0.4

Date 2018-06-13

Author Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

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Description Provides the function 'mixor' for fitting a mixed-effects ordinal and binary response models and associated methods for printing, summarizing, extracting estimated coefficients and variance-covariance matrix, and estimating contrasts for the fitted models.

License GPL (>= 2)

Depends R (>= 2.10), survival

BuildResaveData best

Biarch yes

NeedsCompilation yes

LazyLoad true

Repository CRAN

Date/Publication 2018-06-14 21:17:56 UTC

R topics documented:

mixor-package	*Mixed-Effects Ordinal Regression Analysis*

Description

This package provides a function `mixor` for fitting mixed-effects ordinal and binary response models and associated methods for printing, summarizing, extracting estimated coefficients and the variance-covariance matrix, and estimating contrasts for the fitted models.

Details

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Version:	1.0.4
Date:	2018-06-13
Author:	Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons
Maintainer:	Kellie J. Archer <archer.43@osu.edu>
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This package provides a function mixor for fitting mixed-effects ordinal and binary response models and associated methods for printing, summarizing, extracting estimated coefficients and the variance-covariance matrix, and estimating contrasts for the fitted models.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons Maintainer: Kellie J. Archer <archer.43@osu.edu> Kellie J. Archer <archer.43@osu.edu>

References

Hedeker D. and Gibbons R.D. (1996) A computer program for mixed-effects ordinal regression analysis. *Computer Methods and Programs in Biomedicine* 49, 157-176.

See Also

See also mixor, and examples in norcag, irt.data, concen, SmokeOnset, schizophrenia

Examples

```
library("mixor")
data("SmokingPrevention")
# data frame must be sorted by id variable
SmokingPrevention<-SmokingPrevention[order(SmokingPrevention$class),]
# school model
Fitted.school<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
```

```
    id=school, link="logit")
summary(Fitted.school)
vcov(Fitted.school)
# students in classrooms analysis
Fitted.students<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
    id=class, link="logit", nAGQ=11)
summary(Fitted.students)
coef(Fitted.students)
vcov(Fitted.students)
cm<-matrix(c(-1,-1,-1,0,0,0,0,0,
0,0,0,0,0,0,0,0,
0,0,0,1,0,0,0,1),
ncol=3,byrow=TRUE)
Contrasts(Fitted.students, contrast.matrix=cm)
```

AIC.mixor   *Return AIC for a Fitted Mixor Model*

Description

Returns the AIC of a fitted `mixor` model.

Usage

```
## S3 method for class 'mixor'
AIC(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

AIC of the fitted `mixor` model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, link="probit")
summary(SCHIZO1.fit)
AIC(SCHIZO1.fit)
```

BIC.mixor   *Return BIC for a Fitted Mixor Model*

Description

Returns the BIC of a fitted `mixor` model.

Usage

```
## S3 method for class 'mixor'
BIC(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

BIC of the fitted `mixor` model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, link="probit")
summary(SCHIZO1.fit)
BIC(SCHIZO1.fit)
```

---

coef.mixor	*Extract Model Coefficients*

Description

`coef.mixor` is a generic function which extracts the model coefficients from a fitted model object fit using `mixor`

Usage

```
## S3 method for class 'mixor'
coef(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

Coefficients extracted from the model object.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept model
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
   id=id, link="probit")
coef(SCHIZO1.fit)
```

---

concen   *Twins Trouble Concentrating Data*

Description

Monozygotic and dizygotic twins trouble concentrating data

Usage

```
data(concen)
```

Format

A data frame with 16 observations on the following 6 variables.

ID a numeric vector indicating the unique twin pair ID

TConcen an indicator variable representing trouble concentrating (0 = absent, 1 = present)

int a numeric vector of ones; used in the stand-alone MIXOR program to represent the intercept

Mz an indicator variable representing MZ twins (1 = MZ, 0 = DZ)

Dz an indicator variable representing DZ twins (1 = DZ, 0 = MZ)

freq a numeric vector representing the frequency of the pattern

References

Ramakrishnan V. et al (1992) Elementary methods for the analysis of dichotomous outcomes in unselected samples of twins *Genetic Epidemiology* 9, 273-287.

Examples

```
library("mixor")
data("concen")
# sort the data by twin pair ID
concen<-concen[order(concen$ID),]
# common ICC probit model
Common.ICC<-mixor(TConcen~Mz, data=concen, id=ID, weights=freq,
     link="probit", nAGQ=10, random.effect.mean=FALSE)
summary(Common.ICC)
# Varying ICC probit model
Varying.ICC<-mixor(TConcen~Mz+Dz, data=concen, id=ID, weights=freq,
    which.random.slope=1:2, exclude.fixed.effect=2, link="probit",
    nAGQ=20, random.effect.mean=FALSE, UNID=1)
summary(Varying.ICC)
```

Contrasts   *Estimate Contrasts for Mixor Object*

Description

This function is used to specify and estimate contrasts of interest for a `mixor` object.

Usage

```
Contrasts(fit, contrast.matrix, digits=max(3, getOption("digits") - 2),
    signif.stars=TRUE, dig.tst = max(1, min(5, digits - 1)))
```

Arguments

`fit`	A `mixor` object.
`contrast.matrix`	
	A matrix of contrasts of interest. Each column in the contrast matrix should be of the same length as the `coef` vector of the fitted `mixor` object.
`digits`	minimum number of significant digits to be used for most numbers.
`signif.stars`	logical; if TRUE, P-values are additionally encoded visually as "significance stars" in order to help scanning of long coefficient tables.
`dig.tst`	minimum number of significant digits for the test statistics.

Value

A list containing the following components:

`contrast.matrix`	
	a matrix specifying the contrasts of interest.
`Contrasts`	a matrix containing the estimates, SEs, Z-values, and p-values for the contrasts of interest.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `coef.mixor`, `vcov.mixor`

Examples

```
library("mixor")
data("SmokingPrevention")
# data frame must be sorted by id variable
SmokingPrevention<-SmokingPrevention[order(SmokingPrevention$class),]
Fitted.students<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
      id=class, link="logit")
summary(Fitted.students)
coef(Fitted.students)
vcov(Fitted.students)
cm<-matrix(c(-1,-1,-1,0,0,0,0,0,
              0, 0, 0,0,0,0,0,0,
    0, 0, 0,1,0,0,0,1),ncol=3,byrow=TRUE)
Contrasts(Fitted.students, contrast.matrix=cm)
```

---

deviance.mixor   *Return the deviance for a Fitted Mixor Model*

Description

Returns the deviance of a fitted `mixor` model.

Usage

```
## S3 method for class 'mixor'
deviance(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

Deviance of the fitted `mixor` model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`, `logLik.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
      id=id, link="probit")
summary(SCHIZO1.fit)
deviance(SCHIZO1.fit)
```

---

irt.data   *Armed Servces Vocational Aptitude Battery*

Description

Arithmetic reasoning items from the Armed Servces Vocational Aptitude Battery

Usage

```
data(irt.data)
```

Format

A data frame with 128 observations on the following 13 variables.

ID a numeric vector indicating unique pattern identifier

Resp item response (0 = incorrect; 1 = correct)

int a numeric vector of ones; used in MIXOR stand-alone program to represent the intercept

Item1 Arithmetic reasoning item 1 (0 = no; 1 = yes)

Item2 Arithmetic reasoning item 2 (0 = no; 1 = yes)

Item3 Arithmetic reasoning item 3 (0 = no; 1 = yes)

Item4 Arithmetic reasoning item 4 (0 = no; 1 = yes)

SexF an indicator variable representing gender (0 = female; 1 = male)

SexItem1 Gender by Item1 interaction

SexItem2 Gender by Item2 interaction

SexItem3 Gender by Item3 interaction

SexItem4 Gender by Item4 interaction

freq frequency weight of pattern

References

Mislevy R.J. (1985) Estimation of latent group effects *Journal of the American Statistical Association* 80, 993-997.

Examples

```
library("mixor")
data("irt.data")
## Sort data by ID
irt.data<-irt.data[order(irt.data$ID),]
# 2 parameter logistic IRT model
Fitted.irt<-mixor(Resp~Item1+Item2+Item3+Item4-1, data=irt.data, id=ID,
     weights=freq, which.random.slope=1:4, link="logit", nAGQ=10,
 random.effect.mean=FALSE, UNID=1, vcov=FALSE)
summary(Fitted.irt)
# 2 parameter logistic IRT model with Sex interations on item parameters
Fitted.irt2<-mixor(Resp~Item1+Item2+Item3+Item4+SexItem1+SexItem2+SexItem3+SexItem4-1,
     data=irt.data, id=ID, weights=freq, which.random.slope=1:8, link="logit",
 nAGQ=10, random.effect.mean=FALSE, UNID=1, vcov=FALSE)
summary(Fitted.irt2)
```

---

logLik.mixor *Return the log-likelihood for a Fitted Mixor Model*

Description

Returns the log-likelihood of a fitted `mixor` model.

Usage

```
## S3 method for class 'mixor'
logLik(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

Log-likelihood of the fitted `mixor` model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`, `deviance.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
     id=id, link="probit")
summary(SCHIZO1.fit)
logLik(SCHIZO1.fit)
```

---

mixor   *Mixed-Effects Ordinal Regression Analysis*

Description

This function fits mixed-effects ordinal and binary response models. Various link functions are supported including probit, logistic, and complementary log-log. For longitudinal data, the mixor function allows for individual varying intercepts and slopes across times.

Usage

```
mixor(formula, data, id, which.random.slope = NA, subset, weights,
exclude.fixed.effect = NA, CONV = 1e-04, empirical.prior = FALSE,
quadrature.dist = "Normal", nAGQ = 11, adaptive.quadrature = TRUE,
link = "probit", KG = 0, KS = 0, IADD = -1, indep.re = FALSE,
random.effect.mean = TRUE, UNID = 0, vcov = TRUE)
```

Arguments

formula	an object of class "[formula](#)" (or one that can be coerced to that class): a symbolic description of the model to be fitted.
data	an optional data.frame containing the variables in the model. Note the data.frame must be sorted by id prior to invoking the mixor function.
id	name of clustering variable in the data.frame
which.random.slope	
	which.random.slope=NA means no random slope, only a random intercept is fit. To specify a random slope, which.random.slope is the number of the predictor variable on the RHS of the model formula. More than one variable can have a random slope.
subset	an optional vector specifying a subset of observations to be used in the fitting process.
weights	when supplied, indicates differential weights are used; otherwise each id is weighted equally. weights are the frequency weights to be assigned to each id.

exclude.fixed.effect

the RHS of the model includes both fixed and random effects. Variables are iden-
tified as random effects using which.random.slope. If it is desired that a vari-
able be included in the model without a fixed effect (random only), the number
of that variable(s) in the RHS formula should be passed to exclude.fixed.effects.

CONV   convergence criteria, default is 0.0001.

empirical.prior

logical. If TRUE, uses empirical prior for random effects.

quadrature.dist

distribution for random effects. Either "Normal" (default) or "Uniform".

nAGQ   number of quadrature nodes per dimension. For one random effect, nAGQ=20
is reasonable but should be reduced to 5-10 for multiple random effects.

adaptive.quadrature

logical indicating whether adaptive quadrature (default) or non-adaptive quadra-
ture is performed.

link   Link function, either "probit", "logit", or "cloglog"

KG   an optional integer reflecting the number of covariates to interact with threshold
parameters (the first KG variables on the RHS of the model formula, so the order
of the variables on the RHS of the model formula is important when using KG).
Note that if KG is non-zero, KS must be zero.

KS   an optional integer reflecting the number of covariates used in scaling (the first
KS variables on the RHS of the model formula, so the order of the variables on
the RHS of the model formula is important when using KS). Note that if KS is
non-zero, KG must be zero.

IADD   indicates how XB part of model is included; -1 subtract covariates and mean of
random effects from thresholds; 1 add covariates and mean of random effects to
thresholds. Default is -1 (subtract XB).

indep.re   logical. If TRUE, independent random effects. Default is FALSE which as-
sumes correlated random effects.

random.effect.mean

logical. If TRUE, estimate the mean of the random effects.

UNID   indicator variable where 0 = random effects are multi-dimensional; 1 = random
effects are variables related to a uni-dimensional random effect (e.g., item indi-
cators of a latent variable).

vcov   logical. Default is vcov=TRUE which returns estimates of the the random-effect
variance-covariance matrix. When vcov=FALSE, then estimates of the Cholesky
(matrix square-root) of the random-effect variance-covariance matrix are re-
turned.

Details

A typical model has the form response ~ terms where response is the (numeric) response vector and
terms is a series of terms which specifies a linear predictor for response. The response can also be
a censored survival response, of the form Surv(time,censorvariable)

Value

A list with components:

`call`	Model call formula
`Deviance`	Model deviance
`Quadrature.points`	
	number of quadrature nodes per dimension used in fit
`Model`	a matrix summarizing the model fit including columns Estimate, SE, Z, and P-value
`varcov`	The variance-covariance matrix
`EBmean`	empirical Bayes estimates of the means of the posterior distribution for each id
`EBvar`	empirical Bayes estimates of posterior variance/covariance for each id)
`RIDGEMAX`	Ridge
`RLOGL`	Log-likelihood
`SE`	a matrix corresponding the standard errors of the parameters estimates in `coef`
`AIC`	AIC
`SBC`	Schwarz criterion
`AICD`	Akaike information criterion
`SBCD`	deviance information criterion
`MU`	mean of random effects
`ALPHA`	fixed effects estimates
`SIGMA`	random effects variance-covariance matrix
`GAM`	thresholds
`TAU`	scaling parameter estimates when proportional odds are not assumed. Returns when KG is non-zero.
`IADD`	indicates how the XB part of model was included; -1 subtract covariates and mean of random effects from thresholds; 1 add covariates and mean of random effects to thresholds.
`Y`	the response from the fitted model.
`X`	the random effects terms from the fitted model.
`W`	the fixed effects terms from the fitted model.
`MAXJ`	the number of ordinal levels.
`random.effect.mean`	
	If TRUE, the mean of the random effects was estimated.
`KS`	integer reflecting the number of covariates that were specified to use in scaling (the first KS variables on the RHS of the model formula).
`KG`	integer reflecting the number of covariates that were specified to interact with the threshold parameters (the first KG variables on the RHS of the model formula).
`id`	name of clustering variable in the `data.frame`

which.random.slope
>
> the number of the predictor variable on the RHS of the model formula having a random slope. When `which.random.slope=NA`, only a random intercept model was fit.

ICEN   if 1 indicates right-censoring was considered in the model fit.

link   Link function, either `"probit"`, `"logit"`, or `"cloglog"`

terms   terms from the fitted model.

Note

This function is essentially a wrapper for the MIXOR stand-alone program by Hedeker and Gibbons with added generic methods in R to enhance functionality. Note that the Fortran wrapper requires missing values to be denoted by -9 rather than NA.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

References

Hedeker D. and Gibbons R.D. (1996) A computer program for mixed-effects ordinal regression analysis. *Computer Methods and Programs in Biomedicine* 49, 157-176. Hedeker D and Gibbons R.D. (2006) *Longitudinal Data Analysis*, Wiley, Hoboken, New Jesery.

See Also

See Also as `summary.mixor`, `predict.mixor`, `coef.mixor`, `vcov.mixor`, `print.mixor`

Examples

```
library("mixor")
data("SmokingPrevention")
# data frame must be sorted by id variable
SmokingPrevention<-SmokingPrevention[order(SmokingPrevention$class),]
# school model
Fitted.school<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
    id=school, link="logit")
summary(Fitted.school)
vcov(Fitted.school)
# students in classrooms analysis
Fitted.students<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
    id=class, link="logit")
summary(Fitted.students)
coef(Fitted.students)
vcov(Fitted.students)
cm<-matrix(c(-1,-1,-1,0,0,0,0,0,
             0, 0, 0,0,0,0,0,0,
  0, 0, 0,1,0,0,0,1),ncol=3,byrow=TRUE)
Contrasts(Fitted.students, contrast.matrix=cm)
```

---

mixor-deprecated   *Deprecated Functions in Package mixor*

Description

These functions are provided for compatibility with older versions of `mixor` only, and will be defunct at the next release.

Details

The following functions are deprecated and will be made defunct; use the replacement indicated below:

  • mixord: `mixor`

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons, Maintainer: Kellie J. Archer <kjarcher@vcu.edu>

---

mixord   *Old Function Name Replaced with mixor*

Description

The `mixord` function has been deprecated. Please use the `mixor` function for fitting longitudinal/clustered ordinal response models

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

---

norcag   *Attitudes Towards Sex Data from the 1989 General Social Survey*

Description

Each subject provided ordinal responses on three items concerning their opinion on early teens (age 14-16) having sex before marriage (Item1), a man and a woman having sex before marriage (Item2), and a married person having sex with someone other than their spouse (Item3). Data are provided as frequencies by response pattern.

Usage

```
data(norcag)
```

Format

A data frame with 105 observations on the following 6 variables.

ID a numeric vector indicating unique patient identifier

SexItems ordinal item response coded as 1 = always wrong; 2 = almost always wrong; 3 = wrong only sometimes; 4 = not wrong

int a numeric vector of ones; used in the stand-alone MIXOR program to indicate the intercept

Item2vs1 attitude towards premarital vs teenage sex

Item3vs1 attitude towards extramarital vs teenage sex

freq frequency weight of the pattern

Source

Agresti A. and Lang J.B. (1993) A proportional odds model with subject-specific effects for repeated ordered categorical responses, *Biometrika* 80, 527-534.

References

Hedeker D. and Mermelstein R.J. (1998) A multilevel thresholds of change model for analysis of stages of change data, *Multivariate Behavioral Research* 33, 427-455.

Examples

```
library("mixor")
data("norcag")
# random intercepts model assuming proportional odds for differences in item responses
Fitted.norcag<-mixor(SexItems~Item2vs1+Item3vs1, data=norcag, id=ID,
    weights=freq, link="logit", nAGQ=20)
summary(Fitted.norcag)
# random intercepts model assuming non-proportional odds for differences in item responses
Fitted.norcag.np<-mixor(SexItems~Item2vs1+Item3vs1, data=norcag, id=ID,
    weights=freq, link="logit", nAGQ=10, KG=2)
```

```
summary(Fitted.norcag.np)
# SCALING model
Fitted.norcag.scale<-mixor(SexItems~Item2vs1+Item3vs1, data=norcag, id=ID,
     weights=freq, link="logit", nAGQ=10, KS=2)
summary(Fitted.norcag.scale)
```

---

plot.mixor   *Plot empirical Bayes estimates of random effects for a Mixor Model*
                               Object

Description

Plot of empirical Bayes estimates of random effects from a fitted `mixor` model object.

Usage

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

Arguments

x   a `mixor` object.

...   other arguments.

Value

For each random effect, a histogram and normal quantile-quantile plot of empirical Bayes estimates.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
     id=id, link="probit")
plot(SCHIZO1.fit)
```

---

predict.mixor *Predict Outcome From Mixor Fitted Model*

Description

predict method for class mixor.

Usage

```
## S3 method for class 'mixor'
predict(object, newdata = NULL, na.action = na.fail, ...)
```

Arguments

object   an object of class mixor.

newdata   an optional data frame to be used for obtaining predictions when the random
            effects are zero. When newdata is not supplied, the random effects estimates
            are used in obtaining model predictions. All variables used in the mixor model,
            the fixed and the random effects models, as well as the grouping factors, must
            be present in the data frame.

na.action   a function that indicates what should happen when newdata contains NAS. The
            default action (na.fail) causes the function to print an error message and ter-
            minate if there are any incomplete observations.

...   other arguments.

Details

This function returns fitted probabilities and the predicted class from a fitted mixor object. When
the newdata parameter is specified, the random effects are taken to be zero and predictions are
returned. Otherwise conditional predictions, which includes both fixed and random effects terms,
for the observed data are returned.

Value

predicted   class specific probabilities from the fitted model.

class   predicted class, that having the largest fitted probability, from the fitted model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also mixor, print.mixor

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
     id=id, link="probit")
pihat<-predict(SCHIZO1.fit)
table(pihat$class, schizophrenia$imps79o)
head(pihat$predicted)
```

---

print.mixor   *Printing Mixor Model Fits*

Description

print method for class `mixor`.

Usage

```
## S3 method for class 'mixor'
print(x, digits = max(3L, getOption("digits") - 3L), ...)
```

Arguments

x	an object of class `mixor`.
digits	the number of significant digits to use when printing.
...	further arguments passed to or from other methods.

Value

The function `print.mixor` prints the model call and coefficients from the `mixor` object.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`, `coef.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, link="probit")
print(SCHIZO1.fit)
### Random intercept and slope
SCHIZO2.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, which.random.slope=2, link="probit")
print(SCHIZO2.fit)
```

---

schizophrenia   *National Institute of Mental Health Schizophrenia Collaborative Study*

Description

In the NIMH Schizophrenia Collaborative Study, patients were randomized to receive one of four medications, either placebo or one of three different anti-psychotic drugs. The protocol indicated subjects were to then be evaluated at weeks 0, 1, 3, 6 to assess severity of illness; additionally some measurements were made at weeks 2, 4, and 5.

Usage

```
data(schizophrenia)
```

Format

A data frame with 1603 observations on the following 9 variables.

id   a numeric vector indicating the unique patient identifier

imps79   a numeric vector from item 79 on the Inpatient Multidimensional Psychiatric Scale indicating severity of illness. The scores were applied to be interpreted as follows: 1 = normal, not ill at all; 2 = borderline mentally ill; 3 = mildly ill; 4 = moderately ill; 5 = markedly ill; 6 = severly ill; 7 = among the most extremely ill

imps79b   a binary version of imps79

imps79o   an ordinally scaled version of imps79

int   a numeric vector of ones; used in stand-alone package to indicate intercept

TxDrug   a numeric vector indicating treatment with drug (1) or placebo (0)

Week   a numeric vector indicating time, in weeks

SqrtWeek   the square root of the Week variable

TxSWeek   a variable representing the TxDrug x Week interaction

Source

From http://tigger.uic.edu/~hedeker/SCHIZX1.DAT.txt

References

Hedeker D. and Gibbons R.D. (1996) A computer program for mixed-effects ordinal regression analysis. *Computer Methods and Programs in Biomedicine* 49, 157-176. Hedeker D and Gibbons R.D. (2006) *Longitudinal Data Analysis*, Wiley, Hoboken, New Jesery.

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, link="probit")
summary(SCHIZO1.fit)
### Random intercept and slope
SCHIZO2.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, which.random.slope=2, link="probit")
summary(SCHIZO2.fit)
# random intercept and trend with independent random effects; using logit link
SCHIZO3.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, which.random.slope=2, indep.re=TRUE, link="logit")
summary(SCHIZO3.fit)
```

SmokeOnset	*Smoking Onset Data*

Description

From the Television School and Family Smoking Prevention and Cessation Project, a study designed to increase knowledge of the effects of tobacco use in school-age children.

Usage

```
data(SmokeOnset)
```

Format

A data frame with 1556 observations on the following 10 variables.

school a numeric vector identifying the unique school in the Los Angeles area

class a numeric vector identifying classroom

student a numeric vector identifying student

smkonset a numeric vector indicating time to smoking or right-censoring (post-intervention=1, 1 year follow-up=2, and 2 year follow-up=3). For these data right-censoring means that the observation was observed at the indicated timepoint (and had not smoked at that timepoint or at earlier timepoints), but was not observed at subsequent timepoints or thereafter.

event a numeric vector indicating whether the student smoked (1) or did not (0)

int a numeric vector of ones; used in stand-alone MIXOR program to represent the intercept

SexMale a numeric vector indicating gender of the student (0=Female, 1=Male)

cc a numeric vector indicating whether the school was randomized to a social-resistance classroom curriculum (1=Yes, 0=No)

tv a numeric vector indicating whether the school was randomized to a media (television) intervention (1=Yes, 0=No)

cctv a numeric vector indicating whether the school was randomized to CC combined with TV

References

Flay B.R., Brannon B.R., Johnson C.A. et al. (1989) The television, school and family smoking cessation and prevention project: I. Theoretical basis and program development, *Preventive Medicine* 17, 585-607.

Hedeker D., Siddiqui O. and Hu F.B. Random-effects regression analysis of correlated grouped-time survival data, *Statistical Methods in Medical Research* 9,161-179.

Hedeker D and Gibbons R.D. (2006) *Longitudinal Data Analysis*, Wiley, Hoboken, New Jesery.

Examples

```
library("mixor")
data("SmokeOnset")
require("survival")
### Grouped survival time example
### students in classrooms analysis
Surv.mixor<-mixor(Surv(smkonset,event)~SexMale+cc+tv, data=SmokeOnset,
    id=class, link="cloglog", nAGQ=20, IADD=1)
Surv.mixor
vcov(Surv.mixor)
### students in schools analysis
School.mixor<-mixor(Surv(smkonset,event)~SexMale+cc+tv, data=SmokeOnset,
    id=school, link="cloglog", nAGQ=20, IADD=1)
School.mixor
vcov(School.mixor)
### students in classrooms analysis with varying Sex effect across time intervals
students.mixor<-mixor(Surv(smkonset,event)~SexMale+cc+tv, data=SmokeOnset,
    id=class, link="cloglog", KG=1, nAGQ=20, IADD=1)
students.mixor
```

SmokingPrevention | *Television School and Family Smoking Prevention and Cessation Project Data*

Description

From the Television School and Family Smoking Prevention and Cessation Project, a study designed to increase knowledge of the effects of tobacco use in school-age children.

Usage

```
data(SmokingPrevention)
```

Format

A data frame with 1600 observations on the following 9 variables.

school a numeric vector identifying the Los Angeles school

class a numeric vector identifying classroom

thksord a numeric vector reflecting quartiles of the post-intervention tobacco and health knowledge scale scor

thksbin a binary version of the post-intervention tobacco and health knowledge scale score

int a numeric vector of ones; used in the stand-alone MIXOR program to represent the intercept

thkspre the pre-intervention tobacco and health knowledge scale score

cc a numeric vector indicating whether the school was randomized to a social-resistance classroom curriculum (1=Yes, 0=No

tv a numeric vector indicating whether the school was randomized to a media (television) intervention (1=Yes, 0=No)

cctv a numeric vector indicating whether the school was randomized to CC combined with TV

References

Flay B.R., Brannon B.R., Johnson C.A. et al. (1988) The television, school and family smoking cessation and prevention project: I. Theoretical basis and program development, *Preventive Medicine* 17, 585-607.

Hedeker D. and Gibbons R.D. (1996) A computer program for mixed-effects ordinal regression analysis. *Computer Methods and Programs in Biomedicine* 49, 157-176.

Hedeker D and Gibbons R.D. (2006) *Longitudinal Data Analysis*, Wiley, Hoboken, New Jesery.

Examples

```
library("mixor")
data("SmokingPrevention")
# sort dataset by id; note for these data sorting by class will also sort by school
SmokingPrevention<-SmokingPrevention[order(SmokingPrevention$class),]
# school model
Fitted.school<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
    id=school, link="logit")
summary(Fitted.school)
vcov(Fitted.school)
# students in classrooms analysis; not run
#Fitted.students<-mixor(thksord~thkspre+cc+tv+cctv, data=SmokingPrevention,
#    id=class, link="logit")
#summary(Fitted.students)
#vcov(Fitted.students)
```

---

summary.mixor *Summarize Mixor Model Fit*

Description

summary method for class mixor.

Usage

```
## S3 method for class 'mixor'
summary(object, digits=max(3, getOption("digits") - 2),
    signif.stars=TRUE, dig.tst = max(1, min(5, digits - 1)), ...)
```

Arguments

object	an object of class mixor.
digits	minimum number of significant digits to be used for most numbers.
signif.stars	logical; if TRUE, P-values are additionally encoded visually as "significance stars" in order to help scanning of long coefficient tables.
dig.tst	minimum number of significant digits for the test statistics.
...	other arguments.

Value

Prints the following items extracted from the fitted mixor object: the call to mixor (model formula), mode Deviance, Log-likelihood, RIDGEMAX, AIC, SBC, and model paramter estimates along with their SE, Z, and p-value.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also mixor, print.mixor, coef.mixor

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
    id=id, link="probit")
summary(SCHIZO1.fit)
```

---

vcov.mixor   *Return Variance-Covariance Matrix for a Mixor Model Object*

Description

Returns the variance-covariance matrix of a fitted `mixor` model object.

Usage

```
## S3 method for class 'mixor'
vcov(object, ...)
```

Arguments

object   a `mixor` object.

...   other arguments.

Value

A matrix of the estimated covariances between the parameter estimates in the model.

Author(s)

Kellie J. Archer, Donald Hedeker, Rachel Nordgren, Robert D. Gibbons

See Also

See Also as `mixor`, `summary.mixor`

Examples

```
library("mixor")
data("schizophrenia")
### Random intercept
SCHIZO1.fit<-mixor(imps79o ~ TxDrug + SqrtWeek + TxSWeek, data=schizophrenia,
     id=id, link="probit")
summary(SCHIZO1.fit)
vcov(SCHIZO1.fit)
```

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