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Description Conditional logistic regression with longitudinal follow up and individual-level random coefficients: A stable and efficient two-step estimation method.

License GPL-2

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TwoStepCLogit-package *Conditional Logistic Regression: A Two-Step Estimation Method*

Description

Conditional logistic regression with longitudinal follow up and individual-level random coefficients: A stable and efficient two-step estimation method (see `Ts.estim`).

Details

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Author(s)

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References

Craiu, R.V., Duchesne, T., Fortin, D. and Baillargeon, S. (2011), Conditional Logistic Regression with Longitudinal Follow-up and Individual-Level Random Coefficients: A Stable and Efficient Two-Step Estimation Method, *Journal of Computational and Graphical Statistics*. **20**(3), 767-784.

bison *Bison Dataset*

Description

Bison data collected in Prince Albert National Park, Saskatchewan, Canada (Craiu et al. 2011).

Format

A data frame with 16818 observations on the following 10 variables.

Cluster pair of animals (dyad) ID

Strata stratum ID

Y response variable: 1 for visited locations, 0 otherwise

water land cover indicator covariate: 1 for water, 0 otherwise

agric land cover indicator covariate: 1 for agricultural locations , 0 otherwise

forest land cover indicator covariate: 1 for forests, 0 otherwise

meadow land cover indicator covariate: 1 for meadows, 0 otherwise

biomass continuous covariate: above-ground vegetation biomass index measured (in kg/m^2) only at locations within meadows, 0 otherwise

pmeadow continuous covariate: the proportion of meadow in a circular plot (700 m in radius) centered at the bison's location

Details

This data set was collected in order to study habitat selection by groups of free-ranging bison. For each observed group, two individuals (dyad) equipped with GPS radio-collars were followed simultaneously. A cluster is defined here as a pair of bison. This data set contains 20 clusters. The number of strata per cluster varies between 13 and 345 for a total of 1410 strata. A stratum is composed of two visited GPS locations (one for each individual) gathered at the same time, together with 10 random locations (five drawn within 700 m of each of the two focal bison). Therefore, there are 12 observations per stratum, with 2 cases (Y=1) and 10 controls (Y=0). However, due to problems in the data collection, 17 of the 1410 strata have only 6 observations (1 case and 5 controls).

References

Craiu, R.V., Duchesne, T., Fortin, D. and Baillargeon, S. (2011), Conditional Logistic Regression with Longitudinal Follow-up and Individual-Level Random Coefficients: A Stable and Efficient Two-Step Estimation Method, *Journal of Computational and Graphical Statistics*. **20**(3), 767-784.

Examples

```
# Some descriptive statistics about the data set:
ddim(formula = Y ~ strata(Strata) + cluster(Cluster), data = bison)

# Model 1: covariates meadow, biomass and biomass^2
# Random effects in front of biomass and biomass^2
# Main diagonal covariance structure for D
Fit1 <- Ts.estim(formula = Y ~ meadow + biomass + I(biomass^2) +
        strata(Strata) + cluster(Cluster), data = bison,
        random = ~ biomass + I(biomass^2), all.m.1=FALSE, D="UN(1)")

Fit1
```

```
# Model 2: only covariates biomass and biomass^2
# Random effects in front of biomass and biomass^2
# Main diagonal covariance structure for D
Fit2 <- Ts.estim(formula = Y ~ biomass + I(biomass^2) + strata(Strata) +
        cluster(Cluster), data = bison, all.m.1=FALSE, D="UN(1)")
Fit2
# Results reported in Table 2 of Craiu et al. (2011).
```

---

ddim *Data Dimension Statistics*

Description

Function that computes dimension statistics for a data set with clusters and strata and its `print` method.

Usage

```
ddim(formula, data)

## S3 method for class 'ddim'
print(x, ...)
```

Arguments

`formula`	A formula object, with the response on the left of a `~` operator and, on the right hand side, a `strata` and a `cluster` term (ex. `formula = Y ~ strata(var_strata) + cluster(var_cluster)`). The `strata` and `cluster` functions (from the package survival) are used to identify the stratification and the cluster variables, respectively.
`data`	A data frame (or object coercible by as.data.frame to a data frame) containing the variables in the model.
`x`	An object, produced by the `ddim` function, to print.
`...`	Further arguments to be passed to `print.default`.

Value

`Sc`	The number of strata in each cluster.
`Ystat`	A data.frame with `n`, the numbers of observations per stratum (n_s^c), and `m`, the sum of the responses per stratum (m_s^c).

See Also

`Ts.estim`

Examples

```
dimstat <- ddim(formula = Y ~ strata(Strata) + cluster(Cluster), data = bison)
dimstat
```

`Ts.estim` *Two-Step Estimator*

Description

Function that computes the two-step estimator proposed in Craiu et al. (2011) and its `print` method.

Usage

```
Ts.estim(
  formula,
  data,
  random,
  all.m.1 = FALSE,
  D = "UN(1)",
  itermax = 2000,
  tole = 1e-06
)

## S3 method for class 'Ts.estim'
print(x, ...)
```

Arguments

`formula`	A formula object, with the response on the left of a ~ operator, and the covariates on the right. The right hand side of the model must also include two special terms: a `strata` and a `cluster` term (ex. `formula = Y ~ X1 + X2 + X3 + strata(var_strata) + cluster(var_cluster)`). The `strata` and `cluster` functions (from the package **survival**) are used to identify the stratification and the cluster variables, respectively.
`data`	A data frame (or object coercible by as.data.frame to a data frame) containing the variables in the model.
`random`	A formula object, with a blank on the left of a ~ operator, and, on the right, the covariates with random coefficients among the covariate listed in the model `formula` (ex. `random = ~ X1 + X3`). The default is to add random coefficients for every covariates listed in the model `formula`.
`all.m.1`	`TRUE` if sum of Y's in all strata is 1, `FALSE` otherwise (the default). When in doubt use `FALSE` (always works, but slower than necessary if all stratum sums are 1).
`D`	The form of the between-cluster variance-covariance matrix of the regression coefficients (matrix D) : either `"UN"` for unstructured matrix D or `"UN(1)"` (the default) for diagonal matrix D.

itermax	maximal number of EM iterations (default = 2000)
tole	maximal distance between successive EM iterations tolerated before declaring convergence (default = 0.000001)
x	An object, produced by the Ts.estim function, to print.
...	Further arguments to be passed to print.default.

Details

Calls coxph from the package **survival**.

Value

beta	A vector: the regression coefficients.
se	A vector: the regression coefficients' standard errors.
vcov	A matrix: the variance-covariance matrix of the regression coefficients.
D	A matrix: estimate of the between-cluster variance-covariance matrix of the regression coefficients (matrix D).
r.effect	The random effect estimates.
coxph.warn	A list of character string vectors. If the coxph function generates one or more warnings when fitting the Cox model to a cluster, a copy of these warnings are stored in coxph.warn$Cluster_name where Cluster_name is the identification value for the cluster in the data set. A NULL list element means that coxph did not produce any warnings for that cluster.
Call	The function call.

Author(s)

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References

Craiu, R.V., Duchesne, T., Fortin, D. and Baillargeon, S. (2011), Conditional Logistic Regression with Longitudinal Follow-up and Individual-Level Random Coefficients: A Stable and Efficient Two-Step Estimation Method, *Journal of Computational and Graphical Statistics*. **20**(3), 767-784.

See Also

ddim

Examples

```
# Two ways for specifying the same model
# Data: bison
# Model: covariates forest, biomass and pmeadow
# Random effects in front of forest and biomass
# Main diagonal covariance structure for D (the default)
way1 <- Ts.estim(formula = Y ~ forest  + biomass + pmeadow +
        strata(Strata) + cluster(Cluster), data = bison,
```

```
        random = ~ forest + biomass)
way1
way2 <- Ts.estim(formula = bison[,3] ~ as.matrix(bison[,c(6,8:9)]) +
        strata(bison[,2]) + cluster(bison[,1]), data = bison,
        random = ~ as.matrix(bison[,c(6,8)]))
way2

# Unstructured covariance for D
Fit <- Ts.estim(formula = Y ~ forest  + biomass + pmeadow +
        strata(Strata) + cluster(Cluster), data = bison,
        random = ~ forest + biomass, D="UN")
Fit
```

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