Package 'firthb'

December 23, 2023

Type Package

Title Firth-type penalized estimation of the modified Poisson and linear regressions for multivariate analyses of risk ratio and risk difference

Version 2.1-1

Date 2023-12-22

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Description The modified Poisson and linear regression analyses have been standard methods for multivariate analyses of binary outcome data in estimating risk ratio and risk difference. Uno and Noma (2023+) <forthcoming> show these multivariate analyses possibly provide biased and/or imprecise estimates under small and sparse data situations (i.e., the "separation" condition). This package provides computational tools of the Firth-type penalized estimating methods for the modified Poisson and linear regressions proposed by Uno and Noma (2023+) <forthcoming>. Also, a bias-corrected sandwich variance estimator under small sample settings is available.

Depends R (>= 3.5.0)

Imports stats, MASS

License GPL-3

Encoding UTF-8

LazyData true

R topics documented:

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firthb-package   *The 'firthb' package.*

Description

Firth-type penalized estimation of the modified Poisson and linear regressions for multivariate analyses of risk ratio and risk difference.

References

Cheung, Y. B. (2007). A modified least-squares regression approach to the estimation of risk difference. *American Journal of Epidemiology* **166**, 1337-1344.

Firth, D. (1993). Bias reduction of maximum likelihood estimates. *Biometrika* **80**, 27-38.

Uno, S. and Noma, H. (2023+). Firth-type penalized methods for the modified Poisson and least-squares regression analyses in estimating risk ratio and risk difference. Forthcoming.

Zou, G. (2004). A modified poisson regression approach to prospective studies with binary data. *American Journal of Epidemiology* **159**, 702-706.

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firthb	*Firth-type penalized estimation of the modified Poisson and linear regressions*

Description

Firth-type penalized estimation of the modified Poisson and linear regressions.

Usage

```
firthb(formula, data, measure)
```

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	A data frame, list or environment (or object coercible by as.data.frame to a data frame) containing the variables in the model.
measure	Type of effect measure: RR (risk ratio) or RD (risk difference)

Value

Results of the modified Poisson and least-squares regression analyses.

- glm+robust SE: Ordinary analyses by modified Poisson and least-squares regressions.
- firth+robust SE: Firth-type penalized analyses using ordinary robust standard error estimates.
- firth+improved robust SE: Firth-type penalized analyses using Uno-Noma's improved robust standard error estimates.

Also, individual outputs are

- EstimatedRR: Regression coefficient estimates for risk ratio (if measure: RR).
- EstimatedRD: Regression coefficient estimates for risk difference (if measure: RD).
- Low95pctCI: Lower limits of the 95
- Upp95pctCI: Upper limits of the 95

References

Cheung, Y. B. (2007). A modified least-squares regression approach to the estimation of risk difference. *American Journal of Epidemiology* **166**, 1337-1344.

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Examples

```
data(titanic)

firthb(Death ~ titanic$is_female + titanic$class_1 + titanic$class_2 + titanic$Age,
 data=titanic, measure="RR")
firthb(Death ~ titanic$is_female + titanic$class_1 + titanic$class_2 + titanic$Age,
 data=titanic, measure="RD")
```

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titanic   *Survival outcomes for Titanic passengers*

Description

- PassengerId: Passenger ID
- Survived: Passenger survival indicator
- Pclass: Passenger class
- Name: Name
- Sex: Sex
- Age: Age
- SibSp: Number of siblings/spouses aboard
- Parch: Number of parents/children aboard
- Ticket: Ticket number
- Fare: Passenger fare
- Cabin: Cabin
- Embarked: Port of embarkation
- is_female: Dummy variable of sex
- class_1: Dummy variable of Pclass
- class_2: Dummy variable of Pclass
- class_3: Dummy variable of Pclass
- Death: 1-Survived

Usage

```
data(titanic)
```

Format

A data frame with 130 rows and 17 variables

References

https://www.kaggle.com/c/titanic/data

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