Package 'caratREG'

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Type Package

Title Regressions and Analysis Methods for Covariate-Adaptive Randomization

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Description
This package implements all of the regression methods considered in Ma et al.(2020) for estimating and inferring the treatment effect under covariate-adaptive randomization.

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Imports dplyr (>= 1.0.0), MASS, stats

RoxygenNote 7.1.1

NeedsCompilation no

R topics documented:

`caratREG-package` *Regressions and Analysis Methods for Covariate-Adaptive Randomization*

Description

This package implements all of the regression methods considered in Ma et al.(2020) for estimating and inferring the treatment effect under covariate-adaptive randomization.

Details

Index of help topics:

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                        Covariate-Adaptive Randomization
tau.adj                 Regression without interaction
tau.diff                Difference in means
tau.interact            Regression with interaction
```

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References

Ma, W., Tu, F., & Liu, H. (2020). *Regression analysis for covariate-adaptive randomization: A robust and efficient inference perspective*. arXiv preprint arXiv:2009.02287.

`tau.adj` *Regression without interaction*

Description

Estimating and inferring the treatment effect based on regression without interaction.

Usage

```
tau.adj(A, B, Y, X = NULL, pi, q, conf.level = 0.95)
```

Arguments

`A`	numeric vector, containing subjects' treatment assignments. Its length should be the same as the number of subjects.
`B`	numeric vector, containing subjects' stratum labels. Its length should be the same as the number of subjects.
`Y`	numeric vector, containing subjects' observed outcomes. Its length should be the same as the number of subjects.
`X`	design matrix, containing additional covariates used in the regression (optional). Each column represents a covariate.
`pi`	numeric, the target treatment proportion in each stratum.
`q`	numeric, indicating the balance level of covariate-adaptive randomizations. Detailed information can be found in Ma et al.(2020), section 2.
`conf.level`	confidence level of the interval. Default is 0.95.

Details

Estimating and inferring the treatment effect based on regression without interaction and (optional) additional covatiates. It follows the idea of Ma et al. (2020) <arXiv:2009.02287>, Section 3.2 and Section 4.2.

Value

It returns an object of class "htest".

The function print is used to obtain results. The generic accessor functions statistic, p.value, conf.int and others extract various useful features of the value returned by adj.test.

An object of class "htest" is a list containing at least the following components:

statistic the value of the t-statistic.

p.value the p-value of the test,the null hypothesis is rejected if p-value is less than the significance level.

conf.int a confidence interval under chosen level conf.level for the difference in treatment effect between treatment group and control group.

estimate estimated treatment effect difference between treatment group and control group.

method a character string indicating what type of test was performed.

References

Ma, W., Tu, F., & Liu, H. (2020). *Regression analysis for covariate-adaptive randomization: A robust and efficient inference perspective*. arXiv preprint arXiv:2009.02287.

Examples

```
n <- 1000
pi <- 0.5
q <- pi*(1-pi)
X1 <- rbeta(n, 2, 2)
X2 <- runif(n, -5, 3)
B <- sample(1:4, n, replace = TRUE)
A <- sample(c(0, 1), n, replace = TRUE, prob = c(1-pi, pi))
Y0 <- 3*log(X1+3)*X2 + rnorm(n,sd = 1)
Y1 <- 1 + 2*X1 + rnorm(n,sd = 2)
Y <- Y0*(1-A) + Y1*A
X <- cbind(X1, X2)
tau.adj(A, B, Y, X, pi, q)
```

---

tau.diff *Difference in means*

Description

Estimating and inferring the treatment effect based on difference in means.

Usage

```
tau.diff(A, B, Y, X = NULL, pi, q, conf.level = 0.95)
```

Arguments

A	numeric vector, containing subjects' treatment assignments. Its length should be the same as the number of subjects.
B	numeric vector, containing subjects' stratum labels. Its length should be the same as the number of subjects.
Y	numeric vector, containing subjects' observed outcomes. Its length should be the same as the number of subjects.
X	design matrix, containing additional covariates used in the regression (optional). Each column represents a covariate.
pi	numeric, the target treatment proportion in each stratum.
q	numeric, indicating the balance level of covariate-adaptive randomizations. Detailed information can be found in Ma et al.(2020), section 2.
conf.level	confidence level of the interval. Default is 0.95.

Details

Estimating and inferring the treatment effect based on difference in means and (optional) additional covatiates. It follows the idea of Ma et al. (2020) <arXiv:2009.02287>, Section 3.1 and Section 4.1.

Value

It returns an object of class "htest".

The function print is used to obtain results. The generic accessor functions statistic, p.value, conf.int and others extract various useful features of the value returned by dme.test.

An object of class "htest" is a list containing at least the following components:

statistic the value of the t-statistic.

p.value the p-value of the test,the null hypothesis is rejected if p-value is less than the significance level.

conf.int a confidence interval under chosen level conf.level for the difference in treatment effect between treatment group and control group.

estimate estimated treatment effect difference between treatment group and control group.

method a character string indicating what type of test was performed.

References

Ma, W., Tu, F., & Liu, H. (2020). *Regression analysis for covariate-adaptive randomization: A robust and efficient inference perspective*. arXiv preprint arXiv:2009.02287.

Examples

```
n <- 1000
pi <- 0.5
q <- pi*(1-pi)
X1 <- rbeta(n, 2, 2)
X2 <- runif(n, -5, 3)
B <- sample(1:4, n, replace = TRUE)
A <- sample(c(0, 1), n, replace = TRUE, prob = c(1-pi, pi))
Y0 <- 3*log(X1+3)*X2 + rnorm(n,sd = 1)
Y1 <- 1 + 2*X1 + rnorm(n,sd = 2)
```

```
Y <- Y0*(1-A) + Y1*A
X <- cbind(X1, X2)
tau.diff(A, B, Y, X, pi, q)
```

`tau.interact` *Regression with interaction*

Description

Estimating and inferring the treatment effect based on regression with interaction.

Usage

```
tau.interact(A, B, Y, X = NULL, pi, q, conf.level = 0.95)
```

Arguments

`A`	numeric vector, containing subjects' treatment assignments. Its length should be the same as the number of subjects.
`B`	numeric vector, containing subjects' stratum labels. Its length should be the same as the number of subjects.
`Y`	numeric vector, containing subjects' observed outcomes. Its length should be the same as the number of subjects.
`X`	design matrix, containing additional covariates used in the regression (optional). Each column represents a covariate.
`pi`	numeric, the target treatment proportion in each stratum.
`q`	numeric, indicating the balance level of covariate-adaptive randomizations. Detailed information can be found in Ma et al.(2020), section 2.
`conf.level`	confidence level of the interval. Default is 0.95.

Details

Estimating and inferring the treatment effect based on regression with interaction and (optional) additional covatiates. It follows the idea of Ma et al. (2020) <arXiv:2009.02287>, Section 3.3 and Section 4.3.

Value

It returns an object of class `"htest"`.

The function `print` is used to obtain results. The generic accessor functions `statistic`, `p.value`, `conf.int` and others extract various useful features of the value returned by `inter.test`.

An object of class `"htest"` is a list containing at least the following components:

statistic the value of the t-statistic.

p.value the p-value of the test,the null hypothesis is rejected if p-value is less than the significance level.

conf.int a confidence interval under chosen level `conf` for the difference in treatment effect between treatment group and control group.

estimate estimated treatment effect difference between treatment group and control group.

method a character string indicating what type of test was performed.

References

Ma, W., Tu, F., & Liu, H. (2020). *Regression analysis for covariate-adaptive randomization: A robust and efficient inference perspective*. arXiv preprint arXiv:2009.02287.

Examples

```
n <- 1000
pi <- 0.5
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X1 <- rbeta(n, 2, 2)
X2 <- runif(n, -5, 3)
B <- sample(1:4, n, replace = TRUE)
A <- sample(c(0, 1), n, replace = TRUE, prob = c(1-pi, pi))
Y0 <- 3*log(X1+3)*X2 + rnorm(n,sd = 1)
Y1 <- 1 + 2*X1 + rnorm(n,sd = 2)
Y <- Y0*(1-A) + Y1*A
X <- cbind(X1, X2)
tau.interact(A, B, Y, X, pi, q)
```

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