Package 'rdhte'

March 24, 2025

Title Heterogeneous Treatment Effects in Regression Discontinuity Designs

Version 0.0.1

Description Understanding heterogeneous causal effects based on pretreatment covariates is a crucial step in modern empirical work in data science. Building on the recent developments in Calonico et al (2025) <https://rdpackages.github.io/references/Calonico-Cattaneo-Farrell-Palomba-Titiunik_2025_HTERD.pdf>, this package provides tools for estimation and inference of heterogeneous treatment effects in Regression Discontinuity (RD) Designs. The package includes two main commands: 'rdhte' to conduct estimation and robust bias-corrected inference for conditional RD treatment effects (given choice of bandwidth parameter); and 'rdbwhte', which implements automatic bandwidth selection methods.

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Imports rdrobust, sandwich

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Contents

`rdhte-package` *rdhte: RD Heterogeneous Treatment Effects Estimation and Inference*

Description

Building on the recent developments in Calonico, Cattaneo, Farrell, Palomba, and Titiunik (2025), this package implements estimation and inference of heterogeneous treatment effects in RD designs. The package includes two main commands: `rdhte` conduct estimation and robust bias-corrected inference for conditional RD treatment effects, for a given choice of bandwidth parameter; and `rdbwhte` implements automatic bandwidth selection methods. We illustrate the methods implemented in the package `rdhte` using a canonical empirical application. We also demonstrate how

the package rdhte complements, and in very specific cases recovers, the methods available in the packages rdrobust (Calonico, Cattaneo, Farrell, Titiunik (2017) and rdmulti, Cattaneo, Titiunik, VazquezBare (2020).

Commands: rdhte for estimation and inference. rdbwhte for data-driven bandwidth selection.

Related Stata and R packages useful for inference in regression discontinuity (RD) designs are described in the website: https://rdpackages.github.io/.

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References

Calonico, Cattaneo, Farrell, Palomba and Titiunik (2025): rdhte: Learning Conditional Average Treatment Effects in RD Designs. *Working paper*.

Calonico, Cattaneo, Farrell, Palomba and Titiunik (2025): Heterogenous Treatment Effects in Regression Discontinuity Designs. *Working paper*

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rdbwhte — *MSE-Optimal Bandwidth Selection for RD Heterogeneous Treatment Effects Estimation*

Description

rdbwhte computes MSE-optimal bandwidths for estimating RD heterogeneous treatment effects based on covariates.

Companion commands: rdhte for RD HTE estimation and inference.

Related Stata and R packages useful for inference in RD designs are described in the website: https://rdpackages.github.io/.

Usage

```
rdbwhte(
  y,
  x,
  c = 0,
  covs.hte = NULL,
  covs.eff = NULL,
  p = 1,
  kernel = "tri",
  vce = "hc3",
  cluster = NULL,
  bw.joint = FALSE
)
```

Arguments

y	Outcome variable.
x	Running variable.
c	Cutoff value (default = 0).
covs.hte	Covariate(s) for heterogeneous treatment effects (required).
covs.eff	Additional covariates for efficiency (optional).
p	Polynomial order (default = 1).
kernel	Kernel type (default = "tri").
vce	Variance estimator (default = "hc3").
cluster	Optional cluster variable.
bw.joint	Logical, use joint bandwidth selection (default = FALSE).

Value

A list with selected bandwidths and model information.

W_lev	vector of group level identifiers.
kernel	kernel type used.
vce	variance estimator used.
c	cutoff value.
h	vector containing the bandwidths used.
p	order of the polynomial used for estimation of the regression function.
N	vector with the original number of observations for each group.
Nh	vector with the effective number of observations for each group.
coef_report	internal value.
rdmodel	rd model.

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References

Calonico, Cattaneo, Farrell, Palomba and Titiunik (2025): rdhte: Learning Conditional Average Treatment Effects in RD Designs. *Working paper*.

Calonico, Cattaneo, Farrell, Palomba and Titiunik (2025): Heterogenous Treatment Effects in Regression Discontinuity Designs. *Working paper*

See Also

rdbwhte

Examples

```
set.seed(123)
n <- 5000
X <- runif(n, -1, 1)
W <- rbinom(n, 1, 0.5)
Y <- 3 + 2*X + 1.5*X^2 + 0.5*X^3 + sin(2*X) + 3*W*(X>=0) + rnorm(n)
rdbwhte.1 = rdbwhte(y=Y, x=X, covs.hte=factor(W))
summary(rdbwhte.1)
```

`rdhte` *RD Heterogeneous Treatment Effects Estimation and Inference*

Description

`rdhte` provides estimation and inference for heterogeneous treatment effects in RDD using local polynomial regression allowing for interactions with pretreatment covariates. Inference is implemented using robust bias-correction methods.

Companion commands: `rdbwhte` for data-driven bandwidth selection.

Related Stata and R packages useful for inference in RD designs are described in the website: https://rdpackages.github.io/.

Usage

```
rdhte(
  y,
  x,
  c = 0,
  covs.hte = NULL,
  covs.eff = NULL,
  p = 1,
  kernel = "tri",
  h = NULL,
  vce = "hc3",
  cluster = NULL,
  level = 95,
  bw.joint = FALSE
)
```

Arguments

`y`	Outcome variable.
`x`	Running variable.
`c`	Cutoff value (default = 0).
`covs.hte`	Covariate(s) for heterogeneous treatment effects (required).
`covs.eff`	Additional covariates for efficiency (optional).
`p`	Polynomial order (default = 1).
`kernel`	Kernel type (default = "tri").
`h`	Choice of bandwidth (optional).

vce	Variance estimator (default = "hc3").
cluster	Optional cluster variable.
level	Confidence level (default = 95).
bw.joint	Logical, use joint bandwidth selection (default = FALSE).

Value

A list with selected RD HTE effects and model information.

Estimate	vector of conventional local-polynomial RD estimates.
Estimate_bc	vector of bias-corrected local-polynomial RD estimates.
se_rb	vector containing robust bias corrected standard errors of the local-polynomial RD estimates.
ci_rb	matrix containing robust bias corrected confidence intervals.
t_rb	vector containing the t-statistics associated with robust local-polynomial RD estimates.
pv_rb	vector containing the p-values associated with robust local-polynomial RD estimates.
coefs	vector containing the coefficients for the jointly estimated p-th order local polynomial model.
vcov	estimated variance-covariance matrix.
W_lev	vector of group level identifiers.
kernel	kernel type used.
vce	variance estimator used.
c	cutoff value.
h	vector containing the bandwidths used.
p	order of the polynomial used for estimation of the regression function.
N	vector with the original number of observations for each group.
Nh	vector with the effective number of observations for each group.
coef_report	internal value.
level	confidence level used.
rdmodel	rd model.

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References

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See Also

rdbwhte

Examples

```
set.seed(123)
n <- 5000
X <- runif(n, -1, 1)
W <- rbinom(n, 1, 0.5)
Y <- 3 + 2*X + 1.5*X^2 + 0.5*X^3 + sin(2*X) + 3*W*(X>=0) + rnorm(n)
rdhte.1 = rdhte(y=Y, x=X, covs.hte=factor(W))
summary(rdhte.1)
```

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