Statistics/Data analysis

Title

rdmc —— Analysis of Regression Discontinuity Designs with Multiple Cutoffs.

Syntax

rdmc *depvar runvar* [*if*] [*in*], **cvar(***string***)** [**fuzzy(***string***) derivvar(***string***) pooled_opt(***string***) verbose pvar(***string***) qvar(***string***) hvar(***string***) hrightvar(***string***) bvar(***string***) brightvar(***string***) rhovar(***string***) covsvar(***string***) covsdropvar(***string***) kernelvar(***string***) weightsvar(***string***) bwselectvar(***string***) scaleparvar(***string***) scaleregulvar(***string***) masspointsvar(***string***) bwcheckvar(***string***) bwrestrictvar(***string***) stdvarsvar(***string***) vcevar(***string***) level(#) plot graph_opt(***string***)**]

Description

rdmc provides tools to analyze regression discontinuity (RD) designs with multiple cutoffs. For methodological background see Keele and Titiunik (2015), Cattaneo, Keele, Titiunik and Vazquez-Bare (2016), and Cattaneo, Keele, Titiunik and Vazquez-Bare (2021). It also computes alternative estimation and inference procedures available in the literature.

Companion commands are: rdmcplot for multi-cutoff RD plots, and rdms for multi-score RD estimation and inference.

A detailed introduction to this command is given in Cattaneo, Titiunik and Vazquez-Bare (2020).

Companion R functions are also available here.

This command employs the Stata (and R) package rdrobust for underlying calculations. See Calonico, Cattaneo and Titiunik (2014), Calonico, Cattaneo and Titiunik (2015), and Calonico, Cattaneo, Farrell and Titiunik (2017) for more details.

Related Stata and R packages useful for inference in RD designs are described in the following website:

https://rdpackages.github.io/

Options

Estimand

cvar(*string***)** specifies the numeric variable containing the RD cutoff for *indepvar* for each unit in the sample.

fuzzy(*string***)** indicates a fuzzy design. See rdrobust for details.

derivvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the order of the derivative for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

rdrobust Options

pooled_opt(*string***)** specifies the options to be passed to **rdrobust** to calculate pooled estimates. See rdrobust for details.

verbose displays the output from **rdrobust** for estimating the pooled estimand.

Local Polynomial Regression

pvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the order of the polynomials for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

qvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the order of the polynomials for bias estimation for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

hvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the bandwidths for **rdrobust** to calculate cutoff-specific estimates. When **hrightvar** is specified, **hvar** indicates the bandwidth to the left of the cutoff. When **hrightvar** is not specified, the same bandwidths are used at each side. See rdrobust for details.

hrightvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the bandwidths to the right of the cutoff for **rdrobust** to calculate cutoff-specific estimates. When **hrightvar** is not specified, the bandwidths in **hvar** are used at each side. See rdrobust for details.

bvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the bandwidths for bias estimation for **rdrobust** to calculate cutoff-specific estimates. When **brightvar** is specified, **hvar** indicates the bandwidth to the left of the cutoff. When **brightvar** is not specified, the same bandwidths are used at each side. See rdrobust for details.

brightvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the bandwidths for bias estimation to the right of the cutoff for **rdrobust** to calculate cutoff-specific estimates. When **brightvar** is not specified, the bandwidths in **bvar** are used at each side. See rdrobust for details.

rhovar(*string***)** a variable of length equal to the number of different cutoffs that specifies the value of rho for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

covsvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the covariates for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

covsdropvar(*string***)** a variable of length equal to the number of different cutoffs that specifies whether collinear covariates should be dropped. See rdrobust for details.

kernelvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the kernels for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

weightsvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the weights for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

Bandwidth Selection

bwselectvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the bandwidth selection method for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

scaleparvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the value of scalepar for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

scaleregulvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the value of scaleregul for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

masspointsvar(*string***)** a variable of length equal to the number of different cutoffs that specifies how to handle repeated values in the running variable. See rdrobust for details.

bwcheckvar(*string***)** a variable of length equal to the number of different cutoffs that specifies the value of **bwcheck**. See rdrobust for details.

bwrestrictvar(*string***)** a variable of length equal to the number of different cutoffs that specifies whether computed bandwidths are restricted to the range of *runvar*. See rdrobust for details.

stdvarsvar(*string***)** a variable of length equal to the number of different cutoffs that specifies whether *depvar* and *runvar* are standardized. See rdrobust for details.

Variance-Covariance Estimation

vcevar(*string***)** a variable of length equal to the number of different cutoffs that specifies the variance-covariance matrix estimation method for **rdrobust** to calculate cutoff-specific estimates. See rdrobust for details.

level(#) specifies the confidence level for confidence intervals. See rdrobust for details.

Plot

plot plots the pooled and cutoff-specific estimates and the weights given by the pooled estimate to each cutoff-specific estimate.

graph_opt(*string***)** options to be passed to the graph when **plot** is specified.

Examples

Standard use of rdmc

```
. rdmc yvar xvar, c(cvar)
```

rdmc with plots of estimates and weights

```
. rdmc yvar xvar, c(cvar) plot
```

rdmc showing output from **rdrobust** and specifying uniform kernel

```
. rdmc yvar xvar, c(cvar) verbose pooled_opt(kernel(uniform))
```

Saved results

rdmc saves the following in **e()**:

Scalars

e(tau_weight)	weighted estimate
e(se_weight_rb)	robust bias corrected s.e. for weighted estimate
e(pv_weight_rb)	robust bias corrected p-value for weighted estimate
e(ci_weight_l)	left limit of robust bias corrected confidence interval for weighted estimate
e(ci_weight_r)	right limit of robust bias corrected confidence interval for weighted estimate
e(N_h_l)	effective sample size to the left of the cutoff used to estimate weighted estimand
e(N_h_r)	effective sample size to the right of the cutoff used to estimate weighted estimand
e(tau_pool)	pooled estimate
e(se_rb)	robust bias corrected s.e. for pooled estimate
e(pv_rb)	robust bias corrected p-value
e(ci_rb_l)	left limit of robust bias corrected confidence interval
e(ci_rb_r)	right limit of robust bias corrected confidence interval
e(h_l)	bandwidth to the left of the cutoff used to estimate pooled estimand
e(h_r)	bandwidth to the right of the cutoff used to estimate pooled estimand
e(N_h_l)	sample size within bandwidth to the left of the cutoff used to estimate pooled estimand
e(N_h_r)	sample size within bandwidth to the right of the cutoff used to estimate pooled estimand

Matrices

e(b)	bias-corrected coefficient vector
e(V)	robust variance-covariance matrix of the estimators
e(coefs)	conventional coefficient vector
e(pv_rb)	robust p-value vector
e(CI_rb)	bias-corrected confidence intervals
e(H)	vector of bandwidths at each side of each cutoff
e(weights)	vector of weights for each cutoff-specific estimate
e(sampsis)	vector of sample sizes at each side of each cutoff

References

Calonico, S., M. D. Cattaneo, M. H. Farrell, and R. Titiunik. 2017. rdrobust: Software for Regression Discontinuity Designs.
Stata Journal 17(2): 372-404.

Calonico, S., M. D. Cattaneo, and R. Titiunik. 2014. Robust Data-Driven Inference in the Regression-Discontinuity Design.
Stata Journal 14(4): 909-946.

Calonico, S., M. D. Cattaneo, and R. Titiunik. 2015. rdrobust: An R Package for Robust Nonparametric Inference in Regression-Discontinuity Designs.
R Journal 7(1): 38-51.

Cattaneo, M. D., L. Keele, R. Titiunik, and G. Vazquez-Bare. 2016. Interpreting Regression Discontinuity Designs with Multiple Cutoffs.
Journal of Politics 78(4): 1229-1248.

Cattaneo, M. D., L. Keele, R. Titiunik, and G. Vazquez-Bare. 2021. Extrapolating Treatment Effects in Multi-Cutoff Regression Discontinuity Designs.
Journal of American Statistical Association, forthcoming.

Cattaneo, M. D., R. Titiunik, and G. Vazquez-Bare. 2020. Analysis of Regression Discontinuity Designs with Multiple Cutoffs or Multiple Scores.
Stata Journal, forthcoming.

Keele, L., and R. Titiunik. 2015. Geographic Boundaries as Regression Discontinuities.
Political Analysis 23(1): 127-155.

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