Package ‘rdmulti’

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Type Package

Title Analysis of RD Designs with Multiple Cutoffs or Scores

Version 0.5

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Description The regression discontinuity (RD) design is a popular quasi-experimental design for causal inference and policy evaluation. The ‘rdmulti’ package provides tools to analyze RD designs with multiple cutoffs or scores: rdmc() estimates pooled and cutoff specific effects for multi-cutoff designs, rdmcplot() draws RD plots for multi-cutoff designs and rdms() estimates effects in cumulative cutoffs or multi-score designs. See Cattaneo, Titiunik and Vazquez-Bare (2020) <https://sites.google.com/site/rdpackages/rdmulti/Cattaneo-Titiunik-VazquezBare_2020_Stata.pdf> for further methodological details.

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Description

The regression discontinuity (RD) design is a popular quasi-experimental design for causal inference and policy evaluation. The 'rdmulti' package provides tools to analyze RD designs with multiple cutoffs or scores: rdmc() estimates pooled and cutoff-specific effects in multi-cutoff designs, rdmcplot() draws RD plots for multi-cutoff RD designs and rdms() estimates effects in cumulative cutoffs or multi-score designs. For more details, and related Stata and R packages useful for analysis of RD designs, visit https://sites.google.com/site/rdpackages.

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References

M.D. Cattaneo, R. Titiunik and G. Vazquez-Bare. (2020). Analysis of Regression Discontinuity Designs with Multiple Cutoffs or Multiple Scores. Working paper.

Usage

dmrc( 
  Y, 
  X, 
  C, 
  fuzzy = NULL, 
  derivvec = NULL, 
  pooled_opt = NULL, 
  verbose = FALSE, 
  pvec = NULL, 
  qvec = NULL, 
  hmat = NULL, 
  bmat = NULL, 
  rhovec = NULL, 
)
covsvec = NULL,
covs_dropvec = NULL,
kernelvec = NULL,
weightsvec = NULL,
bwselectvec = NULL,
scaleparvec = NULL,
scaleregulvec = NULL,
masspointsvec = NULL,
bwcheckvec = NULL,
bwrestrictvec = NULL,
stdvarsvec = NULL,
vcevec = NULL,
nnmatchvec = NULL,
cluster = NULL,
level = 95,
plot = FALSE
)

Arguments

Y         outcome variable.
X         running variable.
C         cutoff variable.
fuzzy     specifies a fuzzy design. See rdrobust() for details.
derivvec  vector of cutoff-specific order of derivatives. See rdrobust() for details.
pooled_opt options to be passed to rdrobust() to calculate pooled estimand.
verbose   displays the output from rdrobust for estimating the pooled estimand.
pvec      vector of cutoff-specific polynomial orders. See rdrobust() for details.
qvec      vector of cutoff-specific polynomial orders for bias estimation. See rdrobust() for details.
hmat      matrix of cutoff-specific bandwidths. See rdrobust() for details.
bmat      matrix of cutoff-specific bandwidths for bias estimation. See rdrobust() for details.
rhovec    vector of cutoff-specific values of rho. See rdrobust() for details.
covsvec   vector of cutoff-specific covariates. See rdrobust() for details.
covs_dropvec vector indicating whether collinear covariates should be dropped at each cutoff. See rdrobust() for details.
kernelvec vector of cutoff-specific kernels. See rdrobust() for details.
weightsvec vector of cutoff-specific weights. See rdrobust() for details.
bwselectvec vector of cutoff-specific bandwidth selection methods. See rdrobust() for details.
scaleparvec vector of cutoff-specific scale parameters. See rdrobust() for details.
scaleregulvec vector of cutoff-specific scale regularization parameters. See rdrobust() for details.
masspointsvec vector indicating how to handle repeated values at each cutoff. See \texttt{rdrobust()} for details.

bwcheckvec vector indicating the value of bwcheck at each cutoff. See \texttt{rdrobust()} for details.

bwrestrictvec vector indicating whether computed bandwidths are restricted to the range or runvar at each cutoff. See \texttt{rdrobust()} for details.

stdvarsvec vector indicating whether variables are standardized at each cutoff. See \texttt{rdrobust()} for details.

vcevec vector of cutoff-specific variance-covariance estimation methods. See \texttt{rdrobust()} for details.

nnmatchvec vector of cutoff-specific nearestneighbors for variance estimation. See \texttt{rdrobust()} for details.

cluster cluster ID variable. See \texttt{rdrobust()} for details.

level confidence level for confidence intervals. See \texttt{rdrobust()} for details.

plot plots cutoff-specific estimates and weights.

\textbf{Value}

\begin{itemize}
  \item \texttt{tau} pooled estimate
  \item \texttt{se.rb} robust bias corrected standard error for pooled estimate
  \item \texttt{pv.rb} robust bias corrected p-value for pooled estimate
  \item \texttt{ci.rb.l} left limit of robust bias corrected CI for pooled estimate
  \item \texttt{ci.rb.r} right limit of robust bias corrected CI for pooled estimate
  \item \texttt{hl} bandwidth to the left of the cutoff for pooled estimate
  \item \texttt{hr} bandwidth to the right of the cutoff for pooled estimate
  \item \texttt{Nh.l} sample size within bandwidth to the left of the cutoff for pooled estimate
  \item \texttt{Nh.r} sample size within bandwidth to the right of the cutoff for pooled estimate
  \item \texttt{B} vector of bias-corrected estimates
  \item \texttt{V} vector of robust variances of the estimates
  \item \texttt{Coefs} vector of conventional estimates
  \item \texttt{W} vector of weights for each cutoff-specific estimate
  \item \texttt{Nh} vector of sample sizes within bandwidth
  \item \texttt{CI} robust bias-corrected confidence intervals
  \item \texttt{H} matrix of bandwidths
  \item \texttt{Pv} vector of robust p-values
  \item \texttt{rdrobust.results} results from \texttt{rdrobust} for pooled estimate
\end{itemize}

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rdmcplot

References

M.D. Cattaneo, R. Titiunik and G. Vazquez-Bare. (2020). Analysis of Regression Discontinuity Designs with Multiple Cutoffs or Multiple Scores. Working paper.

Examples

# Toy dataset
X <- runif(1000,0,100)
C <- c(rep(33,500),rep(66,500))
Y <- (1 + X + (X>=C))*(C==33)+(.5 + .5*X + .8*(X>=C))*(C==66) + rnorm(1000)
# rdmc with standard syntax
tmp <- rdmc(Y,X,C)

rdmcplot

RD plots with multiple cutoffs.

Description

drdmcplot() RD plots with multiple cutoffs.

Usage

rdmcplot(
  Y,
  X,
  C,
  nbinsmat = NULL,
  binselectvec = NULL,
  scalevec = NULL,
  supportmat = NULL,
  pvec = NULL,
  hmat = NULL,
  kernelvec = NULL,
  weightsvec = NULL,
  covsvec = NULL,
  covs_evalvec = NULL,
  covs_dropvec = NULL,
  ci = NULL,
  col_bins = NULL,
  pch_bins = NULL,
  col_poly = NULL,
  lty_poly = NULL,
  col_xline = NULL,
  lty_xline = NULL,
  nobins = FALSE,
nopoly = FALSE,
noxline = FALSE,
nodraw = FALSE
)

Arguments

Y  outcome variable.
X  running variable.
C  cutoff variable.
nbinsmat matrix of cutoff-specific number of bins. See rdplot() for details.
binselectvec vector of cutoff-specific bins selection method. See rdplot() for details.
scalevec vector of cutoff-specific scale factors. See rdplot() for details.
supportmat matrix of cutoff-specific support conditions. See rdplot() for details.
pvec vector of cutoff-specific polynomial orders. See rdplot() for details.
hmat matrix of cutoff-specific bandwidths. See rdplot() for details.
kernelvec vector of cutoff-specific kernels. See rdplot() for details.
weightsvec vector of cutoff-specific weights. See rdplot() for details.
covvec vector of cutoff-specific covariates. See rdplot() for details.
covs_evalvec vector indicating the evaluation point for additional covariates should be dropped at each cutoff. See rdrobust() for details.
covs_dropvec vector indicating whether collinear covariates should be dropped at each cutoff. See rdrobust() for details.
ci adds confidence intervals of the specified level to the plot. See rdrobust() for details.
col_bins vector of colors for bins.
pch_bins vector of characters (pch) type for bins.
col_poly vector of colors for polynomial curves.
lty_poly vector of lty for polynomial curves.
col_xline vector of colors for vertical lines.
lty_xline vector of lty for vertical lines.
nobins omits bins plot.
nopoly omits polynomial curve plot.
noxline omits vertical lines indicating the cutoffs.
nodraw omits plot.
Value

clist  list of cutoffs

cnum  number of cutoffs

X0  matrix of X values for control units

X1  matrix of X values for treated units

Yhat0  estimated polynomial for control units

Yhat1  estimated polynomial for treated units

Xmean  bin average of X values

Ymean  bin average for Y values

CI_l  lower end of confidence intervals

CI_r  upper end of confidence intervals

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References

M.D. Cattaneo, R. Titiunik and G. Vazquez-Bare. (2020). Analysis of Regression Discontinuity Designs with Multiple Cutoffs or Multiple Scores. Working paper.

Examples

# Toy dataset
X <- runif(1000,0,100)
C <- c(rep(33,500),rep(66,500))
Y <- (1 + X + (X>=C))*(C==33)+(.5 + .5*X + .8*(X>=C))*(C==66) + rnorm(1000)
# rdmcpplot with standard syntax
tmp <- rdmcpplot(Y,X,C)
Usage

rdms(
    Y,  
    X,  
    C,  
    X2 = NULL,  
    zvar = NULL,  
    C2 = NULL,  
    rangemat = NULL,  
    xnorm = NULL,  
    fuzzy = NULL,  
    derivvec = NULL,  
    pooled_opt = NULL,  
    pvec = NULL,  
    qvec = NULL,  
    hmat = NULL,  
    bmat = NULL,  
    rhovec = NULL,  
    covsvec = NULL,  
    covs_dropvec = NULL,  
    kernelvec = NULL,  
    weightsvec = NULL,  
    bwselectvec = NULL,  
    scaleparvec = NULL,  
    scaleregulvec = NULL,  
    masspointsvec = NULL,  
    bwcheckvec = NULL,  
    bwrestrictvec = NULL,  
    stdvarsvec = NULL,  
    vcevec = NULL,  
    nnmatchvec = NULL,  
    cluster = NULL,  
    level = 95,  
    plot = FALSE
)

Arguments

Y  outcome variable.
X  running variable.
C  vector of cutoffs.
X2  if specified, second running variable.
zvar  if X2 is specified, treatment indicator.
C2  if specified, second vector of cutoffs.
rangemat  matrix of cutoff-specific ranges for the running variable.
xnorm  normalized running variable to estimate pooled effect.
fuzzy specifies a fuzzy design. See `rdrobust()` for details.
derivvec vector of cutoff-specific order of derivatives. See `rdrobust()` for details.
pooled_opt options to be passed to `rdrobust()` to calculate pooled estimand.
pvec vector of cutoff-specific polynomial orders. See `rdrobust()` for details.
qvec vector of cutoff-specific polynomial orders for bias estimation. See `rdrobust()` for details.
hmat matrix of cutoff-specific bandwidths. See `rdrobust()` for details.
bmat matrix of cutoff-specific bandwidths for bias estimation. See `rdrobust()` for details.
rhovec vector of cutoff-specific values of rho. See `rdrobust()` for details.
covsvec vector of cutoff-specific covariates. See `rdrobust()` for details.
covs_dropvec vector indicating whether collinear covariates should be dropped at each cutoff. See `rdrobust()` for details.
kernelvec vector of cutoff-specific kernels. See `rdrobust()` for details.
weightsvec vector of cutoff-specific weights. See `rdrobust()` for details.
bwselectvec vector of cutoff-specific bandwidth selection methods. See `rdrobust()` for details.
scaleparvec vector of cutoff-specific scale parameters. See `rdrobust()` for details.
scaleregulvec vector of cutoff-specific scale regularization parameters. See `rdrobust()` for details.
masspointsvec vector indicating how to handle repeated values at each cutoff. See `rdrobust()` for details.
bwcheckvec vector indicating the value of bwcheck at each cutoff. See `rdrobust()` for details.
bwrestrictvec vector indicating whether computed bandwidths are restricted to the range or runvar at each cutoff. See `rdrobust()` for details.
stdvarsvec vector indicating whether variables are standardized at each cutoff. See `rdrobust()` for details.
vcevec vector of cutoff-specific variance-covariance estimation methods. See `rdrobust()` for details.
nnmatchvec vector of cutoff-specific nearestneighbors for variance estimation. See `rdrobust()` for details.
cluster cluster ID variable. See `rdrobust()` for details.
level confidence level for confidence intervals. See `rdrobust()` for details.
plot plots cutoff-specific and pooled estimates.

Value

B vector of bias-corrected coefficients
V variance-covariance matrix of the estimators
Coefs vector of conventional coefficients
Nh  vector of sample sizes within bandwidth at each cutoff
CI  bias corrected confidence intervals
H  bandwidth used at each cutoff
Pv  vector of robust p-values

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References
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Examples
# Toy dataset: cumulative cutoffs
X <- runif(1000,0,100)
C <- c(33,66)
Y <- (1+X)*(X<=C[1])+(0.8+0.8*X)*(X>C[1]&X<C[2])+(1.2+1.2*X)*(X>=C[2]) + rnorm(1000)
# rmds: basic syntax
tmp <- rdms(Y,X,C)
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