Package ‘robomit’

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Title Robustness Checks for Omitted Variable Bias
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Description Robustness checks for omitted variable bias. The package includes robustness checks proposed by Oster (2019). robomit the estimate i) the bias-adjusted treatment correlation or effect and ii) the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result based on the framework by Oster (2019). Additionally, robomit offers a set of sensitivity analysis and visualization functions. See: Oster, E. 2019. <doi:10.1080/07350015.2016.1227711>.

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**Description**

Estimates beta*, i.e., the bias-adjusted treatment effect (or correlation) (following Oster 2019).

**Usage**

```r
o_beta(y, x, con, m = "none", w = NULL, id = "none", time = "none", delta = 1, R2max, type, data)
```

**Arguments**

- `y`: Name of the dependent variable (as string).
- `x`: Name of the independent treatment variable (i.e., variable of interest; as string).
- `con`: Name of related control variables. Provided as string in the format: "w + z +...".
- `m`: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w`: weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id`: Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time`: Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `delta`: delta for which beta* should be estimated (default is delta = 1).
- `R2max`: Maximum R-square for which beta* should be estimated.
- `type`: Model type (either `lm` or `plm`; as string).
- `data`: Dataset.

**Details**

Estimates beta*, i.e., the bias-adjusted treatment effect (or correlation).

**Value**

Returns tibble object, which includes beta* and various other information.
References


Examples

# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate beta*
o_beta(y = "mpg", # dependent variable
    x = "wt", # independent treatment variable
    con = "hp + qsec", # related control variables
    delta = 1, # delta
    R2max = 0.9, # maximum R-square
    type = "lm", # model type
    data = data_oster) # dataset

Description

Estimates bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019).

Usage

  o_beta_boot(y, x, con, m = "none", w = NULL, id = "none", time = "none", delta = 1, R2max, sim, obs, rep, type, useed = NA, data)

Arguments

  y  Name of the dependent variable (as string).
  x  Name of the independent treatment variable (i.e., variable of interest; as string).
  con Name of related control variables. Provided as string in the format: "w + z +...".
  m  Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
  w  weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
id  Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
time  Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
delta  delta for which beta*s should be estimated (default is delta = 1).
R2max  Maximum R-square for which beta*s should be estimated.
sim  Number of simulations.
obs  Number of draws per simulation.
rep  Bootstrapping either with (= TRUE) or without (= FALSE) replacement.
type  Model type (either \texttt{lm} or \texttt{plm}; as string).
useed  User defined seed.
data  Dataset.

Details
Estimates bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see \texttt{lm} objects in R) and fixed effect panel (see \texttt{plm} objects in R) models.

Value
Returns tibble object, which includes bootstrapped beta*s.

References

Examples
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate bootstrapped beta*s
o_beta_boot(y = "mpg",  # dependent variable
            x = "wt",  # independent treatment variable
            con = "hp + qsec",  # related control variables
            delta = 1,  # delta
            R2max = 0.9,  # maximum R-square
            sim = 100,  # number of simulations
            obs = 30,  # draws per simulation
o_beta_boot_inf

rep = FALSE, # bootstrapping with or without replacement
type = "lm", # model type
useed = 123, # seed
data = data_oster) # dataset

---

**o_beta_boot_inf**  
*Bootstrapped mean beta* and confidence intervals*

---

**Description**

Provides the mean and confidence intervals of estimated bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019).

**Usage**

```r
o_beta_boot_inf(y, x, con, m = "none", w = NULL, id = "none", time = "none",
delta = 1, R2max, sim, obs, rep, CI, type, useed = NA, data)
```

**Arguments**

- `y` Name of the dependent variable (as string).
- `x` Name of the independent treatment variable (i.e., variable of interest; as string).
- `con` Name of related control variables. Provided as string in the format: "w + z +...".
- `m` Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w` weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id` Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time` Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `delta` delta for which beta*s should be estimated (default is delta = 1).
- `R2max` Maximum R-square for which beta*s should be estimated.
- `sim` Number of simulations.
- `obs` Number of draws per simulation.
- `rep` Bootstrapping either with (= TRUE) or without (= FALSE) replacement
- `CI` Confidence intervals, indicated as vector. Can be and/or 90, 95, 99.
- `type` Model type (either `lm` or `plm`; as string).
- `useed` User defined seed.
- `data` Dataset.
Details

Provides the mean and confidence intervals of estimated bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see \textit{lm} objects in R) and fixed effect panel (see \textit{plm} objects in R) models.

Value

Returns tibble object, which includes the mean and confidence intervals of estimated bootstrapped beta*s.

References


Examples

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# compute the mean and confidence intervals of estimated bootstrapped beta*s
o_beta_boot_inf(y = "mpg", # dependent variable
                 x = "wt", # independent treatment variable
                 con = "hp + qsec", # related control variables
                 delta = 1, # delta
                 R2max = 0.9, # maximum R-square
                 sim = 100, # number of simulations
                 obs = 30, # draws per simulation
                 rep = FALSE, # bootstrapping with or without replacement
                 CI = c(90, 95, 99), # confidence intervals
                 type = "lm", # model type
                 useed = 123, # seed
                 data = data_oster) # dataset
```

Description

Estimates and visualizes bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019).
Usage

```r
o_beta_boot_viz(y, x, con, m = "none", w = NULL, id = "none", time = "none",
delta = 1, R2max, sim, obs, rep, CI, type, norm = TRUE, bin,
col = c("#08306b", "#4292c6", "#c6dbef"), nL = TRUE, mL = TRUE, useed = NA, data)
```

Arguments

- `y`: Name of the dependent variable (as string).
- `x`: Name of the independent treatment variable (i.e., variable of interest; as string).
- `con`: Name of related control variables. Provided as string in the format: "w + z +...".
- `m`: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w`: weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id`: Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time`: Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `delta`: delta for which beta*s should be estimated (default is delta = 1).
- `R2max`: Maximum R-square for which beta*s should be estimated.
- `sim`: Number of simulations.
- `obs`: Number of draws per simulation.
- `rep`: Bootstrapping either with (= TRUE) or without (= FALSE) replacement
- `CI`: Confidence intervals, indicated as vector. Can be and/or 90, 95, 99.
- `type`: Model type (either `lm` or `plm`; as string).
- `norm`: Option to include a normal distribution in the plot (default is norm = TRUE).
- `bin`: Number of bins used in the histogram.
- `col`: Colors used to indicate different confidence interval levels (indicated as vector). Needs to be the same length as the variable CI. The default is a blue color range.
- `nL`: Option to include a red vertical line at 0 (default is nL = TRUE).
- `mL`: Option to include a vertical line at mean of all beta*s (default is mL = TRUE).
- `useed`: User defined seed.
- `data`: Dataset.

Details

Estimates and visualizes bootstrapped beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see `lm` objects in R) and fixed effect panel (see `plm` objects in R) models.
Value

Returns ggplot2 object, which depicts the bootstrapped beta*s.

References


Examples

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate and visualize bootstrapped beta*s
o_beta_boot_viz(y = "mpg", x = "wt", con = "hp + qsec", delta = 1, R2max = 0.9, sim = 100, obs = 30, rep = FALSE, CI = c(90, 95, 99), type = "lm", norm = TRUE, bin = 200, useed = 123, data = data_oster)
```

**Description**

Estimates beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019) over a range of maximum R-squares.

**Usage**

```r
o_beta_rsq(y, x, con, m = "none", w = NULL, id = "none", time = "none", delta = 1, type, data)
```
Arguments

- **y**: Name of the dependent variable (as string).
- **x**: Name of the independent treatment variable (i.e., variable of interest; as string).
- **con**: Name of related control variables. Provided as string in the format: "w + z + ...".
- **m**: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- **w**: weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- **id**: Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- **time**: Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- **delta**: delta for which beta*s should be estimated (default is delta = 1).
- **type**: Model type (either lm or plm; as string).
- **data**: Dataset.

Details

Estimates beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019) over a range of maximum R-squares. The range of maximum R-squares starts from the R-square of the controlled model rounded up to the next 1/100 to 1. The function supports linear cross-sectional (see lm objects in R) and fixed effect panel (see plm objects in R) models.

Value

Returns tibble object, which includes beta*s over a range of maximum R-squares.

References


Examples

```R
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate delta*s over a range of maximum R-squares
o_beta_rsq(y = "mpg",  # dependent variable
           x = "cyl",  # independent treatment variable
           con = "disp + hp + drat + wt",  # related control variables
           m = "cyl + disp + hp + drat + wt",  # unrelated control variables
           w = NULL,  # weights
           delta = 1,  # delta
           type = "lm",  # model type
           data = data_oster)  # dataset
```
Description

Estimates and visualizes beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019) over a range of maximum R-squares.

Usage

```
o_beta_rsq_viz(y, x, con, m = "none", w = NULL, id = "none", time = "none", delta = 1, type, data)
```

Arguments

- `y` Name of the dependent variable (as string).
- `x` Name of the independent treatment variable (i.e., variable of interest; as string).
- `con` Name of related control variables. Provided as string in the format: "w + z + ...".
- `m` Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w` weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id` Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time` Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `delta` delta for which beta*s should be estimated (default is delta = 1).
- `type` Model type (either `lm` or `plm`; as string).
- `data` Dataset.

Details

Estimates and visualizes beta*s, i.e., the bias-adjusted treatment effects (or correlations) (following Oster 2019) over a range of maximum R-squares. The range of maximum R-squares starts from the R-square of the controlled model rounded up to the next 1/100 to 1. The function supports linear cross-sectional (see `lm` objects in R) and fixed effect panel (see `plm` objects in R) models.
**Value**

Returns ggplot2 object, which depicts beta*s over a range of maximum R-squares.

**References**


**Examples**

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate and visualize beta*s over a range of maximum R-squares
o_beta_rsq_viz(y = "mpg", # dependent variable
                x = "wt", # independent treatment variable
                con = "hp + qsec", # related control variables
                delta = 1, # delta
                type = "lm", # model type
                data = data_oster) # dataset
```

**Description**

Estimates delta*, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019).

**Usage**

```r
o_delta(y, x, con, m = "none", w = NULL, id = "none", time = "none", beta = 0, R2max, type, data)
```

**Arguments**

- **y**: Name of the dependent variable (as string).
- **x**: Name of the independent treatment variable (i.e., variable of interest; as string).
- **con**: Name of related control variables. Provided as string in the format: "w + z + ...".
- **m**: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.

id Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.

time Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.

beta beta for which delta* should be estimated (default is beta = 0).

R2max Maximum R-square for which delta* should be estimated.

type Model type (either \textit{lm} or \textit{plm}; as string).

data Dataset.

Details

Estimates delta*, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019). The function supports linear cross-sectional (see \textit{lm} objects in R) and fixed effect panel (see \textit{plm} objects in R) models.

Value

Returns tibble object, which includes delta* and various other information.

References


Examples

# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate delta*
o_delta(y = "mpg", # dependent variable
x = "wt", # independent treatment variable
con = "hp + qsec", # related control variables
beta = 0, # beta
R2max = 0.9, # maximum R-square
type = "lm", # model type
data = data_oster) # dataset
**Description**

Estimates bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019).

**Usage**

```r
o_delta_boot(y, x, con, m = "none", w = NULL, id = "none", time = "none", beta = 0, R2max, sim, obs, rep, type, useed = NA, data)
```

**Arguments**

- `y` Name of the dependent variable (as string).
- `x` Name of the independent treatment variable (i.e., variable of interest; as string).
- `con` Name of related control variables. Provided as string in the format: "w + z + ...".
- `m` Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w` weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id` Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time` Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `beta` beta for which delta*s should be estimated (default is beta = 0).
- `R2max` Maximum R-square for which delta*s should be estimated.
- `sim` Number of simulations.
- `obs` Number of draws per simulation.
- `rep` Bootstrapping either with (= TRUE) or without (= FALSE) replacement.
- `type` Model type (either `lm` or `plm`; as string).
- `useed` User defined seed.
- `data` Dataset.

**Details**

Estimates bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see `lm` objects in R) and fixed effect panel (see `plm` objects in R) models.
Value

Returns tibble object, which includes bootstrapped delta*s.

References


Examples

# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate bootstrapped delta*s
o_delta_boot_inf <- o_delta_boot_inf(y = "mpg", # dependent variable
                                      x = "wt", # independent treatment variable
                                      con = "hp + qsec", # related control variables
                                      beta = 0, # beta
                                      R2max = 0.9, # maximum R-square
                                      sim = 100, # number of simulations
                                      obs = 30, # draws per simulation
                                      rep = FALSE, # bootstrapping with or without replacement
                                      type = "lm", # model type
                                      useed = 123, # seed
                                      data = data_oster) # dataset

---

**o_delta_boot_inf**

*Bootstrapped mean delta* and confidence intervals

Description

Provides the mean and confidence intervals of bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019).

Usage

```
o_delta_boot_inf(y, x, con, m = "none", w = NULL, id = "none", time = "none",
beta = 0, R2max, sim, obs, rep, CI, type, useed = NA, data)
```
Arguments

- **y**: Name of the dependent variable (as string).
- **x**: Name of the independent treatment variable (i.e., variable of interest; as string).
- **con**: Name of related control variables. Provided as string in the format: "w + z +...".
- **m**: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- **w**: weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- **id**: Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- **time**: Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- **beta**: beta for which delta*s should be estimated (default is beta = 0).
- **R2max**: Maximum R-square for which delta*s should be estimated.
- **sim**: Number of simulations.
- **obs**: Number of draws per simulation.
- **rep**: Bootstrapping either with (= TRUE) or without (= FALSE) replacement.
- **CI**: Confidence intervals, indicated as vector. Can be and/or 90, 95, 99.
- **type**: Model type (either `lm` or `plm`; as string).
- **useed**: User defined seed.
- **data**: Dataset.

Details

Provides the mean and confidence intervals of bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see `lm` objects in R) and fixed effect panel (see `plm` objects in R) models.

Value

Returns tibble object, which includes the mean and confidence intervals of bootstrapped delta*s.

References

Examples

# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# compute the mean and confidence intervals of estimated bootstrapped delta*s
o_delta_boot_inf(y = "mpg", # dependent variable
                 x = "wt", # independent treatment variable
                 con = "hp + qsec", # related control variables
                 beta = 0, # beta
                 R2max = 0.9, # maximum R-square
                 sim = 100, # number of simulations
                 obs = 30, # draws per simulation
                 rep = FALSE, # bootstrapping with or without replacement
                 CI = c(90,95,99), # confidence intervals
                 type = "lm", # model type
                 useed = 123, # seed
                 data = data_oster) # dataset

o_delta_boot_viz

Visualization of bootstrapped delta*s

Description

Estimates and visualizes bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019).

Usage

o_delta_boot_viz(y, x, con, m = "none", w = NULL, id = "none", time = "none",
beta = 0, R2max, sim, obs, rep, CI, type, norm = TRUE, bin,
col = c("#08306b","#4292c6","#c6dbef"), nL = TRUE, mL = TRUE, useed = NA, data)

Arguments

y
Name of the dependent variable (as string).

x
Name of the independent treatment variable (i.e., variable of interest; as string).

con
Name of related control variables. Provided as string in the format: "w + z + ...".

m
Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.

id Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.

time Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.

beta beta for which delta*s should be estimated (default is beta = 0).

R2max Maximum R-square for which delta*s should be estimated.

sim Number of simulations.

obs Number of draws per simulation.

rep Bootstrapping either with (= TRUE) or without (= FALSE) replacement

CI Confidence intervals, indicated as vector. Can be and/or 90, 95, 99.

type Model type (either \texttt{lm} or \texttt{plm}; as string).

norm Option to include a normal distribution in the plot (default is norm = TRUE).

bin Number of bins used in the histogram.

col Colors used to indicate different confidence interval levels (indicated as vector). Needs to be the same length as the variable CI. The default is a blue color range.

nL Option to include a red vertical line at 0 (default is nL = TRUE).

mL Option to include a vertical line at beta* mean (default is mL = TRUE).

useed User defined seed.

data Dataset.

Details

Estimates and visualizes bootstrapped delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019). Bootstrapping can either be done with or without replacement. The function supports linear cross-sectional (see \texttt{lm} objects in R) and fixed effect panel (see \texttt{plm} objects in R) models.

Value

Returns ggplot2 object, which depicts the bootstrapped delta*s.

References

Examples

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate and visualize bootstrapped delta*s
o_delta_boot_viz(y = "mpg", # dependent variable
                 x = "wt", # independent treatment variable
                 con = "hp + qsec", # related control variables
                 beta = 0, # beta
                 R2max = 0.9, # maximum R-square
                 sim = 100, # number of simulations
                 obs = 30, # draws per simulation
                 rep = FALSE, # bootstrapping with or without replacement
                 CI = c(90,95,99), # confidence intervals
                 type = "lm", # model type
                 norm = TRUE, # normal distribution
                 bin = 200, # number of bins
                 useed = 123, # seed
                 data = data_oster) # dataset
```

Description

Estimates delta*s, i.e., the degree of selection on unobservables relative to observables (with respect
to the treatment variable) that would be necessary to eliminate the result (following Oster 2019) over
a range of maximum R-squares following Oster (2019).

Usage

```r
o_delta_rsq(y, x, con, m = "none", w = NULL, id = "none", time = "none", beta = 0,
type, data)
```

Arguments

- `y` Name of the dependent variable (as string).
- `x` Name of the independent treatment variable (i.e., variable of interest; as string).
- `con` Name of related control variables. Provided as string in the format: "w + z + ...".
- `m` Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.

id
Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.

time
Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.

beta
beta for which delta*s should be estimated (default is beta = 0).

type
Model type (either lm or plm; as string).

data
Dataset.

Details
Estimates delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019) over a range of maximum R-squares. The range of maximum R-squares starts from the R-square of the controlled model rounded up to the next 1/100 to 1. The function supports linear cross-sectional (see lm objects in R) and fixed effect panel (see plm objects in R) models.

Value
Returns tibble object, which includes delta*s over a range of maximum R-squares.

References

Examples

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load roboromit
require(roboromit)

# estimate delta*s over a range of maximum R-squares
o_delta_rsq(y = "mpg", x = "wt", con = "hp + qsec", beta = 0, type = "lm", data = data_oster)
```
Description

Estimates and visualizes delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019) over a range of maximum R-squares.

Usage

```r
o_delta_rsq_viz(y, x, con, m = "none", w = NULL, id = "none", time = "none", beta = 0, type, data)
```

Arguments

- `y`: Name of the dependent variable (as string).
- `x`: Name of the independent treatment variable (i.e., variable of interest; as string).
- `con`: Name of related control variables. Provided as string in the format: "w + z + ...".
- `m`: Name of unrelated control variables (m; see Oster 2019; as string; default is m = "none").
- `w`: Weights (only for weighted estimations). Warning: For weighted panel models R can report different R-square than Stata, leading deviation between R and Stata results.
- `id`: Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect panel models.
- `time`: Name of the time id variable (e.g. year or month; as string). Only applicable for fixed effect panel models.
- `beta`: Beta for which delta*s should be estimated (default is beta = 0).
- `type`: Model type (either `lm` or `plm`; as string).
- `data`: Dataset.

Details

Estimates and visualizes delta*s, i.e., the degree of selection on unobservables relative to observables (with respect to the treatment variable) that would be necessary to eliminate the result (following Oster 2019) over a range of maximum R-squares. The range of maximum R-squares starts from the R-square of the controlled model rounded up to the next 1/100 to 1. The function supports linear cross-sectional (see `lm` objects in R) and fixed effect panel (see `plm` objects in R) models.

Value

Returns ggplot2 object, which depicts delta*s over a range of maximum R-squares.
References


Examples

```r
# load data, e.g. the in-build mtcars dataset
data("mtcars")
data_oster <- mtcars

# preview of data
head(data_oster)

# load robomit
require(robomit)

# estimate and visualize delta*s over a range of maximum R-squares
o_delta_rsq_viz(y = "mpg",  # dependent variable
                 x = "wt",    # independent treatment variable
                 con = "hp + qsec", # related control variables
                 beta = 0,    # beta
                 type = "lm",  # model type
                 data = data_oster) # dataset
```
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