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' replicates (and extends) function available in Stata (closed source) for use in R (open source). See: Oster, E. 2019. <doi:10.1080/07350015.2016.1227711>.

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LazyData true

RoxygenNote 7.1.1

Imports plm, dplyr, ggplot2, broom, tidyr, tibble, stats,

Suggests testthat

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R topics documented:

`o_beta` *Beta**

Description

Estimates beta*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019).

Usage

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

Arguments

`y`	Name of the dependent variable (as string).
`x`	Name of the independent variable of interest (treatment variable; as string).
`con`	Name of the other control variables. Provided as string in the format: "w + z +...".
`id`	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
`time`	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
`delta`	Delta for which beta* should be estimated (default is delta = 1).
`R2max`	Max R-square for which beta* should be estimated.
`type`	Model type (either *lm* or *plm*; as string).
`data`	Data.

Details

Estimates beta*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019). The function supports linear cross sectional (see *lm* objects in R) and panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including beta* and various other information.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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",               # define the dependent variable name
           x = "wt",            # define the main independent variable name
           con = "hp + qsec",   # other control variables
           delta = 1,           # define delta. This is usually set to 1
           R2max = 0.9,         # define the max R-square.
           type = "lm",         # define model type
           data = data_oster)   # define dataset
```

`o_beta_boot` *Bootstrapped betas**

Description

Estimates bootstrapped betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019).

Usage

```
o_beta_boot(y, x, con, 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 variable of interest (treatment variable; as string).
`con`	Name of the other control variables. Provided as string in the format: "w + z +...".
`id`	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
`time`	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
`delta`	Delta for which beta* should be estimated (default is delta = 1).
`R2max`	Max R-square for which beta* 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	Seed number defined by user.
data	Data.

Details

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

Value

Returns tibble object. Including bootstrapped betas*.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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*
o_beta_boot(y = "mpg",                 # define the dependent variable name
                  x = "wt",            # define the main independent variable name
                  con = "hp + qsec",   # other control variables
                  delta = 1,           # define beta. This is usually set to 1
                  R2max = 0.9,         # define the max R-square.
                  sim = 100,           # define number of simulations
                obs = 30,            # define number of drawn observations per simulation
              rep = FALSE,         # define if bootstrapping is with or without replacement
                  type = "lm",         # define model type
                  useed = 123,         # define seed
                  data = data_oster)   # define dataset
```

o_beta_boot_inf *Bootstrapped mean beta* and confidence intervals*

Description

Estimates and provides confidence intervals of bootstrapped betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019).

Usage

```
o_beta_boot_inf(y, x, con, 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 variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
delta	Delta for which beta* should be estimated (default is delta = 1).
R2max	Max R-square for which beta* 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	Seed number defined by user.
data	Data.

Details

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

Value

Returns tibble object. Including bootstrapped betas* and confidence intervals.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize bootstrapped deltas*
o_beta_boot_inf(y = "mpg",                # define the dependent variable name
                    x = "wt",             # define the main independent variable name
                    con = "hp + qsec",    # other control variables
                    delta = 0,            # define delta. This is usually set to 1
                    R2max = 0.9,          # define the max R-square.
                    sim = 100,            # define number of simulations
                  obs = 30,           # define number of drawn observations per simulation
                rep = FALSE,        # define if bootstrapping is with or without replacement
                    CI = c(90,95,99),     # define confidence intervals.
                    type = "lm",          # define model type
                    useed = 123,          # define seed
                    data = data_oster)    # define dataset
```

`o_beta_boot_viz` *Visualization of bootstrapped betas**

Description

Estimates and visualizes bootstrapped betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019).

Usage

```
o_beta_boot_viz(y, x, con, 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 variable of interest (treatment variable; as string).

con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
delta	Delta for which beta* should be estimated (default is delta = 1).
R2max	Max R-square for which beta* 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 = TURE).
bin	Number of bins used for 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	Seed number defined by user.
data	Data.

Details

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

Value

Returns ggplot object. Including bootstrapped betas*.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize bootstrapped betas*
o_beta_boot_viz(y = "mpg",                # define the dependent variable name
                    x = "wt",             # define the main independent variable name
                    con = "hp + qsec",    # other control variables
                    delta = 1,            # define delta This is usually set to 1
                    R2max = 0.9,          # define the max R-square.
                    sim = 100,            # define number of simulations
                  obs = 30,           # define number of drawn observations per simulation
                rep = FALSE,        # define if bootstrapping is with or without replacement
                    CI = c(90,95,99),     # define confidence intervals.
                    type = "lm",          # define model type
                    norm = TRUE,          # include normal distribution
                    bin = 200,            # set number of bins
                    useed = 123,          # define seed
                    data = data_oster)    # define dataset
```

---

o_beta_rsq *Betas* over a range of max R-squares*

Description

Estimates betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019) over a range of max R-squares.

Usage

```
o_beta_rsq(y, x, con, id = "none", time = "none", delta = 1, type, data)
```

Arguments

y	Name of the dependent variable (as string).
x	Name of the independent variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
delta	Delta for which beta* should be estimated (default is delta = 1).
type	Model type (either *lm* or *plm*; as string).
data	Data.

Details

Estimates betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019) over a range of max R-squares. The range of max 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including betas* over a range of max R-squares.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 deltas* over a range of max R-squares
o_beta_rsq(y = "mpg",                 # define the dependent variable name
           x = "wt",                  # define the main independent variable name
           con = "hp + qsec",         # other control variables
           delta = 1,                 # define beta. This is usually set to 1
           type = "lm",               # define model type
           data = data_oster)         # define dataset
```

---

o_beta_rsq_viz *Visualization of betas* over a range of max R-squares*

Description

Estimates and visualizes betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019) over a range of max R-squares.

Usage

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

Arguments

y	Name of the dependent variable (as string).
x	Name of the independent variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
delta	Delta for which beta* should be estimated (default is delta = 1).
type	Model type (either *lm* or *plm*; as string).
data	Data.

Details

For details about the estimation see Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

Estimates and visualizes betas*, i.e. the estimated bias-adjusted treatment effects, following Oster (2019) over a range of max R-squares. The range of max 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns ggplot object. Including betas* over a range of max R-squares.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize betas* over a range of max R-squares
o_beta_rsq_viz(y = "mpg",                # define the dependent variable name
                   x = "wt",             # define the main independent variable name
                   con = "hp + qsec",    # other control variables
                   delta = 1,            # define delta This is usually set to 1
```

```
                    type = "lm",          # define model type
                    data = data_oster)    # define dataset
```

---

o_delta *Delta**

Description

Estimates delta*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019).

Usage

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

Arguments

y	Name of the dependent variable (as string).
x	Name of the independent variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0).
R2max	Max R-square for which beta* should be estimated.
type	Model type (either *lm* or *plm*; as string).
data	Data.

Details

Estimates delta*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019). The function supports linear cross sectional (see *lm* objects in R) and panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including delta* and various other information.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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",               # define the dependent variable name
            x = "wt",            # define the main independent variable name
            con = "hp + qsec",   # other control variables
            beta = 0,            # define beta. This is usually set to 0
            R2max = 0.9,         # define the max R-square.
            type = "lm",         # define model type
            data = data_oster)   # define dataset
```

---

o_delta_boot *Bootstrapped deltas**

Description

Estimates bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019).

Usage

```
o_delta_boot(y, x, con, 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 variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0).
R2max	Max R-square for which beta* 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	Seed number defined by user.
data	Data.

Details

Estimates bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including bootstrapped deltas*.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 deltas*
o_delta_boot(y = "mpg",              # define the dependent variable name
                 x = "wt",           # define the main independent variable name
                 con = "hp + qsec",  # other control variables
                 beta = 0,           # define beta. This is usually set to 0
                 R2max = 0.9,        # define the max R-square.
                 sim = 100,          # define number of simulations
                obs = 30,           # define number of drawn observations per simulation
               rep = FALSE,       # define if bootstrapping is with or without replacement
                 type = "lm",        # define model type
                 useed = 123,        # define seed
                 data = data_oster)  # define dataset
```

o_delta_boot_inf *Bootstrapped mean delta* and confidence intervals*

Description

Estimates mean and provides confidence intervals of bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019).

Usage

```
o_delta_boot_inf(y, x, con, 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 variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0)..
R2max	Max R-square for which beta* 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	Seed number defined by user.
data	Data.

Details

Estimates mean and provides confidence intervals of bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including bootstrapped deltas* and confidence intervals.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize bootstrapped deltas*
o_delta_boot_inf(y = "mpg",                # define the dependent variable name
                     x = "wt",             # define the main independent variable name
                     con = "hp + qsec",    # other control variables
                     beta = 0,             # define beta. This is usually set to 0
                     R2max = 0.9,          # define the max R-square.
                     sim = 100,            # define number of simulations
                   obs = 30,           # define number of drawn observations per simulation
                 rep = FALSE,       # define if bootstrapping is with or without replacement
                     CI = c(90,95,99),     # define confidence intervals.
                     type = "lm",          # define model type
                     useed = 123,          # define seed
                     data = data_oster)    # define dataset
```

`o_delta_boot_viz` *Visualization of bootstrapped deltas**

Description

Estimates and visualizes bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019).

Usage

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

Arguments

y	Name of the dependent variable (as string).
x	Name of the independent variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0).
R2max	Max R-square for which beta* 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 = TURE).
bin	Number of bins used for 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	Seed number defined by user.
data	Data.

Details

Estimates and visualizes bootstrapped deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns ggplot object. Including bootstrapped deltas*.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize bootstrapped deltas*
o_delta_boot_viz(y = "mpg",               # define the dependent variable name
                     x = "wt",            # define the main independent variable name
                     con = "hp + qsec",   # other control variables
                     beta = 0,            # define beta. This is usually set to 0
                     R2max = 0.9,         # define the max R-square.
                     sim = 100,           # define number of simulations
                   obs = 30,          # define number of drawn observations per simulation
                 rep = FALSE,       # define if bootstrapping is with or without replacement
                     CI = c(90,95,99),    # define confidence intervals.
                     type = "lm",         # define model type
                     norm = TRUE,         # include normal distribution
                     bin = 200,           # set number of bins
                     useed = 123,         # define seed
                     data = data_oster)   # define dataset
```

`o_delta_rsq` *Deltas* over a range of max R-squares*

Description

Estimates deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019) over a range of max R-squares following Oster (2019).

Usage

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

Arguments

`y`	Name of the dependent variable (as string).
`x`	Name of the independent variable of interest (treatment variable; as string).
`con`	Name of the other control variables. Provided as string in the format: "w + z +...".
`id`	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.

time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0).
type	Model type (either *lm* or *plm*; as string).
data	Data.

Details

Estimates deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019) over a range of max R-squares. The range of max 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns tibble object. Including deltas* over a range of max R-squares.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 deltas* over a range of max R-squares
o_delta_rsq(y = "mpg",               # define the dependent variable name
            x = "wt",                # define the main independent variable name
            con = "hp + qsec",       # other control variables
            beta = 0,                # define beta. This is usually set to 0
            type = "lm",             # define model type
            data = data_oster)       # define dataset
```

o_delta_rsq_viz *Visualization of deltas* over a range of max R-squares*

Description

Estimates and visualizes deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019) over a range of max R-squares.

Usage

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

Arguments

y	Name of the dependent variable (as string).
x	Name of the independent variable of interest (treatment variable; as string).
con	Name of the other control variables. Provided as string in the format: "w + z +...".
id	Name of the individual id variable (e.g. firm or farm; as string). Only applicable for fixed effect models.
time	Name of the time variable (e.g. year or month; as string). Only applicable for fixed effect models.
beta	Beta for which delta* should be estimated (default is beta = 0).
type	Model type (either *lm* or *plm*; as string).
data	Data.

Details

Estimates and visualizes deltas*, i.e. the degree of selection on unobservables relative to observables that would be necessary to explain away the result, following Oster (2019) over a range of max R-squares. The range of max 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 panel fixed effect (see *plm* objects in R) models.

Value

Returns ggplot object. Including deltas* over a range of max R-squares.

References

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37, 187-204.

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 and visualize deltas* over a range of max R-squares
o_delta_rsq_viz(y = "mpg",               # define the dependent variable name
                    x = "wt",            # define the main independent variable name
                    con = "hp + qsec",   # other control variables
                    beta = 0,            # define beta. This is usually set to 0
                    type = "lm",         # define model type
                    data = data_oster)   # define dataset
```

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