

Package ‘ivregEX’

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Type Package

Title Create Independent Evidence in IV Analyses and Do Sensitivity Analysis in Regression and IV Analysis

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Description Allows you to create an evidence factor (EX analysis) in an instrumental variables regression model. Additionally, performs Sensitivity analysis for OLS analysis, 2SLS analysis and EX analysis with interpretable plotting and printing features.

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ivregEX-package	<i>Create Independent Evidence in IV Analyses and Do Sensitivity Analysis in Regression and IV Analysis</i>
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Description

Allows you to create an evidence factor (EX analysis) in an instrumental variables regression model. Additionally, performs Sensitivity analysis for OLS analysis, 2SLS analysis and EX analysis with interpretable plotting and printing features.

Details

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Author(s)

Bikram Karmakar

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References

~~ Literature or other references for background information ~~

Examples

```

data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

#####

lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW, subset = year == "1995")

z <- senslm(lmfit, variable = 'log(rprice)')
z
plot(z)

#####

library(AER)

fm1 <- ivreg(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995", x=TRUE)

z <- sensIvreg(fm1, variable = 'log(rprice)')
z
plot(z)

#####

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW,
subset = year == "1995")
res = coefitestIV(fm2, lmfit, 'log(rprice)')

z <- sensIvreg(fm2, res, 'log(rprice)', effect = c(-.1, 0, .1, .15, .17))
z
plot(z)

#####

x = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('rprice', 'rincome')]
y = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('packs')]
z = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('tdiff', 'rincome')]

```

```

fm3 <- ivreg.fit.EX(as.matrix(x), y, z)
lmfit <- lm(packs ~ rprice + rincome, data = CigarettesSW, subset = year == "1995")
res = coefstestIV(fm3, lmfit, 'rprice')
z <- sensIvreg(fm3, res, 'rprice', effect = c(-.1, 0, .1, .15, .17))
z
plot(z)

#####

```

coefstestIV

Coefficient test of output of ivreg.EX.

Description

For a given set of endogenous variables in an instrumental variables model `coefstestIV` provides you the coefficients matrix with estimates, std errs, t-ratios and p-values for both homoscedastic and heteroscedastic errors. Also, clustered standard error can be calculated.

Usage

```
coefstestIV(ivregfit, lmfit, vars, cls = NULL, vcov)
```

Arguments

<code>ivregfit</code>	An object of class 'ivregEX', an output of <code>ivreg.EX</code> or <code>ivreg.fit.Ex</code> function.
<code>lmfit</code>	An object of class 'lm', an output of <code>lmfit</code> or <code>lm</code> function.
<code>vars</code>	A vector of endogenous variables of the instrumental variables model for which the standard error calculation and significance test to be performed.
<code>cls</code>	A numeric vector specifying the stratification strata structure of the model. Default setting of <code>NULL</code> assumes no stratification.
<code>vcov</code>	A specification of the covariance matrix of the estimated coefficients. This can be specified as a matrix or as a function yielding a matrix when applied to <code>x</code> . Only used for the computation under heteroscedastic errors. Default is <code>vcovHC</code> .

Details

For details on `vcov` see the documentation of `coefstest` in "lmtest" package.

Value

An object of class 'coefstest'. A matrix of coefficient estimates, standard errors, t-ratios and p-values.

Author(s)

Bikram Karmakar

See Also[coefstest](#)**Examples**

```

data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW,
subset = year == "1995")

res = coefstestIV(fm2, lmfit, 'log(rprice)')

#####
x = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('rprice', 'rincome')]
y = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('packs')]
z = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('tdiff', 'rincome')]

fm3 <- ivreg.fit.EX(as.matrix(x), y, z)
lmfit <- lm(packs ~ rprice + rincome, data = CigarettesSW, subset = year == "1995")
res = coefstestIV(fm3, lmfit, 'rprice')
res

```

`get_nrnrc`*Find the grid structure in plotting*

Description

Takes input the number of plots and returns the argument of `mfrow`. Does not set `mfrow` in `par()`.

Usage

```
get_nrnrc(m, nc = -1, choices = 2:5)
```

Arguments

<code>m</code>	Number of plots, a positive integer.
<code>nc</code>	A preferred choice of number of columns. If set to -1, it is calculated based on choices.
<code>choices</code>	Various choices for <code>nc</code> .

Value

Two numbers for nr and nc in mfrow argument of par().

Note

This is used in plotting results of sensitivity analyses, i.e., outputs of sensIvreg or senslm.

Author(s)

Bikram Karmakar

Examples

```
## Not run:
get_nrnc(6)
get_nrnc(5, 3)

## End(Not run)
```

ivreg.EX

Constructing independent evidence (EX estimates) in an IV regression

Description

This function uses the same arguments as `ivreg` and additionally outputs the EX analysis.

Usage

```
ivreg.EX(formula, instruments, data, subset, na.action, weights, offset,
         contrasts = NULL, model = TRUE, ...)
```

Arguments

<code>formula, instruments</code>	formula specification(s) of the regression relationship and the instruments. Either <code>instruments</code> is missing and <code>formula</code> has three parts as in $y \sim x_1 + x_2 \mid z_1 + z_2 + z_3$ (recommended) or <code>formula</code> is $y \sim x_1 + x_2$ and <code>instruments</code> is a one-sided $formula \sim z_1 + z_2 + z_3$ (only for backward compatibility).
<code>data</code>	an optional data frame containing the variables in the model. By default the variables are taken from the environment of the <code>formula</code> .
<code>subset</code>	an optional vector specifying a subset of observations to be used in fitting the model.
<code>na.action</code>	a function that indicates what should happen when the data contain NAs. The default is set by the <code>na.action</code> option.
<code>weights</code>	an optional vector of weights to be used in the fitting process.
<code>offset</code>	an optional offset that can be used to specify an a priori known component to be included during fitting.

contrasts	an optional list. See the <code>contrasts.arg</code> of <code>model.matrix.default</code> .
model	logicals. If TRUE the corresponding components of the fit (the model frame, the model matrices, the response) are returned.
...	further arguments passed to <code>ivreg.fit.EX</code> .

Details

See Details on the arguments and others see `ivreg` of AER package. Statistical analysis and sensitivity analysis based on the output of `ivreg.EX` is performed in `coefTestIV` and `sensIvreg` functions.

Value

`ivreg.EX` returns an object of class "ivregEX" (also of class "ivreg"), with the following components:

coefficients	parameter estimates.
residuals	a vector of residuals.
fitted.values	a vector of predicted means.
weights	either the vector of weights used (if any) or NULL (if none).
offset	either the offset used (if any) or NULL (if none).
n	number of observations.
nobs	number of observations with non-zero weights.
rank	the numeric rank of the fitted linear model.
df.residual	residual degrees of freedom for fitted model.
cov.unscaled	unscaled covariance matrix for the coefficients.
sigma	residual standard error.
call	the original function call.
formula	the model formula.
terms	a list with elements "regressors" and "instruments" containing the terms objects for the respective components.
levels	levels of the categorical regressors.
contrasts	the contrasts used for categorical regressors.
model	the full model frame (if <code>model = TRUE</code>).
y	the response vector.
x	a list with elements "regressors", "instruments", "projected", containing the model matrices from the respective components. "projected" is the matrix of regressors projected on the image of the instruments.

See Also

[ivreg](#), [coefTestIV](#)

Examples

```
data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW, subset = year == "1995")

coefstestIV(fm2, lmfit, 'log(rprice)')
```

ivreg.fit.EX

Fits the Two Stage Least Squared Estimates and EX estimates

Description

Calculates the instrumental variables model when the output, regressors and instrument matrices are explicitly provided.

Usage

```
ivreg.fit.EX(x, y, z, weights, offset, ...)
```

Arguments

x	regressor matrix.
y	vector with dependent variable.
z	instruments matrix.
weights	an optional vector of weights to be used in the fitting process.
offset	an optional offset that can be used to specify an a priori known component to be included during fitting.
...	further arguments passed to <code>lm.fit</code> or <code>link[stats]{lm.wfit}</code> , respectively.

Details

See documentation of `ivreg.fit` for further operational details.

Statistical inference and sensitivity analysis based on the output of `ivreg.fit.Ex` can be performed using `coefstestIV` and `sensIvreg` functions.

Value

ivreg.fit.EX returns an object of class ivregEX list with the following components:

coefficients	parameter estimates.
residuals	a vector of residuals.
fitted.values	a vector of predicted means.
weights	either the vector of weights used (if any) or NULL (if none).
offset	either the offset used (if any) or NULL (if none).
estfun	a matrix containing the empirical estimating functions.
n	number of observations.
nobs	number of observations with non-zero weights.
rank	the numeric rank of the fitted linear model.
df.residual	residual degrees of freedom for fitted model.
cov.unscaled	unscaled covariance matrix for the coefficients.
sigma	residual standard error.
y	the response vector.
x	a list with elements "regressors", "instruments", "projected", containing the model matrices from the respective components. "projected" is the matrix of regressors projected on the image of the instruments.
coefficientsEX	parameter estimates of the EX analysis
residualsEX	vector of residuals in EX regression
fitted.valuesEX	vector of fitted values in EX regression
what	residuals of first stage of two stage least squared analysis
vars	A list of variable names. List has three vectors for three kinds of variables: 'exogenous', 'endogenous' and 'instruments'.

Author(s)

Bikram Karmakar

See Also

[ivreg.EX](#), [coefestIV](#), [sensIvreg](#), [ivreg.fit](#)

Examples

```
data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)
```

```
x = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('rprice', 'rincome')]
```

```

y = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('packs')]
z = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('tdiff', 'rincome')]

fm3 <- ivreg.fit.EX(as.matrix(x), y, z)

```

`plot.ivregDecision` *Plotting an object of class 'ivregDecision' or 'ivregDecisionList'*

Description

An object of class 'ivregDecisionList', which is a list of objects of class 'ivregDecision', is output of 'sensIvreg.ivregEX'. This function gives you freedom to stylize a gray-scale plot of a sensitivity analysis.

Usage

```

## S3 method for class 'ivregDecision'
plot(x, xaxes = TRUE, yaxes = TRUE, xaxes.label = TRUE,
     yaxes.label = TRUE, legend = TRUE, ...)

## S3 method for class 'ivregDecisionList'
plot(x, xaxes = TRUE, yaxes = TRUE, xaxes.label = TRUE,
     yaxes.label = TRUE, legend = TRUE, subtitle = TRUE, nc, ...)

```

Arguments

<code>x</code>	An object of class 'ivregDecision' or 'ivregDecisionList'. A decision matrix (or list of matrices) for given treatment effect(s) for different values of the sensitivity parameters.
<code>xaxes</code> , <code>yaxes</code> , <code>xaxes.label</code> , <code>yaxes.label</code>	Whether x-axis, y-axis and their labels to be added to the plots.
<code>legend</code>	whether a legend will be added to the plot.
<code>subtitle</code>	Logical for whether a subtitle to be added in a plot indicating the effect size of a 'ivregDecisionList' object.
<code>nc</code>	Optional integer for the number of columns in the plot.
<code>...</code>	Optional arguments for R plotting function.

Author(s)

Bikram Karmakar

See Also

[plot.sensIvregEX](#)

Examples

```

data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW,
subset = year == "1995")
res = coefitestIV(fm2, lmfit, 'log(rprice)')

z <- sensIvreg(fm2, res, 'log(rprice)', delta1 = seq(-.51, .51, .01),
effect = c(-.1, 0, .1, .15, .17))

plot(z$Z[[1]])
plot(z$Z, nc = 3)

```

plot.sensIvregEX

Plotting of Sensitivity Analyses

Description

Based on the output of sensIvreg creates plots of sensitive regions.

Usage

```

## S3 method for class 'sensIvregEX'
plot(x, effect = 0, ...)

```

Arguments

x	An object of class 'sensIvregEX', output of sensIvreg.
effect	Effect size (optional). Default value is 0.
...	Optional arguments for R plotting features.

Note

This functionally creates two sets of plots, one a greyscale plot of the sensitivity analyses in the secondary instrumental variables analysis with independent EX analysis. Additionally it creates a plot of individual sensitivity regions for each analyses for the given effect size.

Author(s)

Bikram Karmakar

See Also

[plot.ivregDecision](#),

Examples

```
data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW, subset = year == "1995")
res = coeftestIV(fm2, lmfit, 'log(rprice)')

z <- sensIvreg(fm2, res, 'log(rprice)', effect = c(-.1, 0, .1, .15, .17), show = FALSE)

plot(z, nc = 3)
```

plot.si

Plot Insensitive Region

Description

This function provides a visual representation of the sensitivity intervals.

Usage

```
## S3 method for class 'si'
plot(x, effect = 0, ...)
```

Arguments

x	An object of class 'si'; output of <code>senslm</code> and <code>sensIvreg.ivreg</code> .
effect	Optional value of the null treatment effect.
...	Optional arguments for the R plotting function.

Note

This function is called as a part of plotting object of class 'sensIvregEX'.

Author(s)

Bikram Karmakar

Examples

```

data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

library(AER)

lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW, subset = year == "1995")

z <- senslm(lmfit, variable = 'log(rprice)')
plot(z)

```

plot_confregion *Plot Confidence Region*

Description

This function provides a visual representation of the confidence regions capturing the three analyses, OLS, 2SLS and EX.

Usage

```

plot_confregion(est, se, t, roundto = 3, xlims, ylims = c(0, .7), ypos = .35,
  xaxis = T, legend = T, xlab = 'Treatment Effect', xlab.cex = 1.3,
  oma = c(4.5, 0, 2, 0), ...)

```

Arguments

est	A numeric vector of length 3, for coeficient estimates of the three analyses - OLS, 2SLS and EX respectively.
se	A numeric vector of length 3, for standard errors of the three analyses - OLS, 2SLS and EX respectively.
t	A number to be used to calculate individual confidence interval by 'est ± t*se'. Default value used is 2. For different level of confidence corresponding value has to be provided.
roundto	The number of decimal digit precision.
xlims	Optional numeric array of size 2 for the plotting region of the treatment effect plotted.
ylims, ypos	Optional arguments. Can be used for plotting aesthetics.
xaxis, legend	Logical arguments for whether the treatment effect axis to be plotted and legends shown.
xlab	A logical argument or a character vecctor for the xaxis label.

<code>xlab.cex</code>	Size of xaxis label.
<code>oma</code>	Outer margin dimensions.
<code>...</code>	Other graphics parameters which are passed to the main plotting function.

Note

This function plots the confidence region of the treatment effect. The confidence region is calculated from the coefficient estimates and standard errors of the OLS, 2SLS and EX. This confidence region has overall level of confidence $(1 - \alpha) \times 100\%$ when each individual analyses are all at the same level of significance. Argument `t` should be used to specify the corresponding quantile.

Resultant confidence region has a four pieces: region where we have no evidence, region where only OLS shows evidence, region where OLS and one of other two estimators provides evidence, and the region where both the IV based estimators show evidence.

This plotting function creates a new plotting device for its plotting purpose.

Author(s)

Bikram Karmakar

Examples

```
est = c(1.6858, 2.8912, 1.1435)
se = c(0.5029, 0.9785, 0.5377)

plot_confregion(est, se, roundto = 3, ypos = .35, xlab.cex = 1.2)
```

```
print.ivregDecision    Printing object of class "ivregDecision"
```

Description

"ivregDecisionList", a list of objects of class "ivregDecision", is part of an output of sensitivity analysis using function 'sensIvreg'.

Usage

```
## S3 method for class 'ivregDecision'
print(x, ...)
```

Arguments

x object of class "ivregDecision".
... Ignore.

Note

Trivially applies to object of class "ivregDecisionList"

Author(s)

Bikram Karmakar

See Also

[plot.ivregDecision](#)

print.si *Printing object of class "si"*

Description

Printing feature of sensitivity intervals. Object of class "si" is found in output of functions sensIvreg and senslm.

Usage

```
## S3 method for class 'si'  
print(x, effect = 0, ...)
```

Arguments

x object of class "si".
effect Null treatment effect.
... Ignore.

Author(s)

Bikram Karmakar

See Also

[plot.si](#)

`sens2SLS`*Sensitivity Interval for Two Stage Least Squared Regression*

Description

This function performs the background sensitivity interval calculation for the 2SLS estimator in an instrumental variables regression model.

Usage

```
sens2SLS(delta2, df, est, se, thatY, rho2, alpha = 0.05, talpha)
```

Arguments

<code>delta2</code>	A numeric vector of values of the second sensitivity parameter. Default value <code>seq(-.1, .1, .01)</code> . Only used for 2SLS estimator.
<code>df, est, se</code>	Degrees of freedom of the model; 2SLS estimate and its standard error.
<code>thatY</code>	t-statistic of the treatment in the regression of the instruments on the treatment.
<code>rho2</code>	squared partial correlation of <code>g(instruments)</code> and the treatment.
<code>alpha</code>	Significance level. Default at 0.05.
<code>talpha</code>	If the interval is to be adjusted for model selection etc, the multiplicative factor to be used. Optional.

Details

See the description of [sensIvreg](#).

Value

Returns an object of class "si".

An object of class "si" is essentially a matrix of two columns for the the upper and lower sensitivity limits corresponding to the sensitivity parameters.

Note

Do not use this function by itself, use `sensIvreg` function.

Author(s)

Bikram Karmakar

See Also

[sensIvreg](#), [plot.si](#)

sensEX	<i>Sensitivity Interval for Secondary EX Estimator</i>
--------	--

Description

This function performs the background sensitivity interval calculation for the EX estimator in an instrumental variables regression model.

Usage

```
sensEX(delta1, df, est, se, rhoYX1.X1sq, alpha = 0.05, talpha)
```

Arguments

delta1	A numeric vector of values of the first sensitivity parameter. Default value <code>seq(-.1, .1, .01)</code> . Not used for 2SLS estimator.
df, est, se	Degrees of freedom of the model; 2SLS estimate and its standard error.
rhoYX1.X1sq	squared partial correlation of the instruments and the treatment.
alpha	Significance level. Default at 0.05.
talpha	If the interval is to be adjusted for model selection etc, the multiplicative factor to be used. Optional.

Details

See the description of [sensIvreg](#).

Value

Returns an object of class "si".

An object of class "si" is essentially a matrix of two columns for the upper and lower sensitivity limits corresponding to the sensitivity parameters.

Note

Do not use this function by itself, use `sensIvreg` function.

Author(s)

Bikram Karmakar

See Also

[sensIvreg](#), [plot.si](#)

Description

This function performs sensitivity analysis for two stage least squared estimator. When output of OLS and EX analyses are also supplied as an object of class "ivregEX" all three sensitivity analyses for the three estimates are performed.

Usage

```
## S3 method for class 'ivregEX'
sensIvreg(ivregfit, coeftestIVres, variable,
delta1 = seq(-0.1, 0.1, 0.01), delta2 = seq(-0.1, 0.1, 0.01),
effect = 0, g = sqrt, errType = c("homoscedastic",
"heteroscedastic"), alpha = 0.05, show = FALSE, ...)

## S3 method for class 'ivreg'
sensIvreg(ivregfit, coeftestIVres, variable,
delta2 = seq(-.1, .1, .01),
g = sqrt, errType = c("homoscedastic", "heteroscedastic"),
alpha = 0.05, ...)
```

Arguments

ivregfit	An object of class ivreg or ivregEX respectively. ivregEX object is an output of ivreg.EX or ivreg.fit.EX . ivreg object is an output of ivreg .
coeftestIVres	An object of class "coeftest". Must be supplied if ivregfitEX as the output of coeftestIV. Optional for only a two stage least squared estimator.
variable	The endogenous variable of interest in the instrumental variables regression model.
delta1	A numeric vector of values of the first sensitivity parameter. Default value seq(-.1, .1, .01). Not used for 2SLS estimator.
delta2	A numeric vector of values of the second sensitivity parameter. Default value seq(-.1, .1, .01). Only used for 2SLS estimator.
effect	A numeric vector of null treat effects of interest. Default 0.
g	A function describing the mechanism by which the assumptions of an instrument may be violated. Default sqrt.
errType	What kind of error structure to be assumed: "homoscedastic" or "heteroscedastic".
alpha	Significance level. Default at 0.05.
show	Whether result is to be printed.
...	Optional. May be ignored. used in sensOLS , sens2SLS or sensEX

Details

delta1 and delta2 are the two sensitivity parameters. delta1 is the partial correlation of the unobservable and the treatment. It measures the amount of violation in the assumption of no-unmeasured confounding. delta2 is the partial correlation of the outcome and $g(\text{instruments})$ measuring the amount of violation in the exogeneity and no direct effect assumption of the instruments.

Only the 2SLS analysis uses delta2, OLS and EX analysis uses delta1 to perform sensitivity analysis.

Value

Returns an object of class "sensIvregEX" if input is of type ivregEX. If the input is of type ivreg, returns an object of class "si".

An object of class "si" is essentially a matrix of two columns for the upper and lower sensitivity limits corresponding to the sensitivity parameters.

An object of class "sensIvregEX" consists of an object of class "ivregDecisionList" and three objects of class "si" for the three estimators. "ivregDecisionList" is a list of overall sensitivity analyses (based on primary OLS and secondary 2SLS and EX analysis. Each list element correspond to the deferent effect values and tells you the sensitivity of the problem for all possible pairs of (delta1, delta2).

Author(s)

Bikram Karmakar

See Also

[senslm](#), [plot.sensIvregEX](#), [plot.si](#)

Examples

```
data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

#####
library(AER)

fm1 <- ivreg(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995", x=TRUE)

z <- sensIvreg(fm1, variable = 'log(rprice)')

#####

fm2 <- ivreg.EX(log(packs) ~ log(rprice) + log(rincome) | tdiff + log(rincome),
data = CigarettesSW, subset = year == "1995")
```

```

lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW,
subset = year == "1995")
res = coefptestIV(fm2, lmfit, 'log(rprice)')

z <- sensIvreg(fm2, res, 'log(rprice)', effect = c(-.1, 0, .1, .15, .17))

#####

x = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('rprice', 'rincome')]
y = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('packs')]
z = CigarettesSW[CigarettesSW[, 'year'] == "1995", c('tdiff', 'rincome')]

fm3 <- ivreg.fit.EX(as.matrix(x), y, z)
lmfit <- lm(packs ~ rprice + rincome, data = CigarettesSW, subset = year == "1995")
res = coefptestIV(fm3, lmfit, 'rprice')
z <- sensIvreg(fm3, res, 'rprice', effect = c(-.1, 0, .1, .15, .17))

#####

```

senslm

Sensitivity analysis of a least squared regression estimator

Description

Performs a sensitivity analysis of the least squared regression

Usage

```
senslm(lmfit, coefmat, variable, delta1 = seq(-0.1, 0.1, 0.01), alpha = 0.05, ...)
```

Arguments

lmfit	An object of class "lm".
coefmat	Optional matrix of class "coefptest" an output of coefptest .
variable	Treatment variable of interest.
delta1	A numeric vector of values of the first sensitivity parameter. Default value <code>seq(-.1, .1, .01)</code> .
alpha	Significance level. Default at 0.05.
...	May be ignored, used in sensOLS .

Details

delta1 is the partial correlation of the unobservable and the treatment. It measures the amount of violation in the assumption of no-unmeasured confounding.

Value

Returns an object of class "si".

An object if class "si" is essentially a matrix of two columns for the the upper and lower sensitivity limits corresponding to the sensitivity parameters.

Author(s)

Bikram Karmakar

See Also

[sensIvreg](#), [plot.sensIvregEX](#), [plot.si](#)

Examples

```
data("CigarettesSW", package = "AER")
CigarettesSW$rprice <- with(CigarettesSW, price/cpi)
CigarettesSW$rincome <- with(CigarettesSW, income/population/cpi)
CigarettesSW$tdiff <- with(CigarettesSW, (taxs - tax)/cpi)

lmfit <- lm(log(packs) ~ log(rprice) + log(rincome), data = CigarettesSW, subset = year == "1995")

z <- senslm(lmfit, variable = 'log(rprice)')
```

sensOLS

Sensitivity Interval for Least Squared Estimator

Description

This function performs the background sensitivity interval calculation for the OLS estimator in a regression model.

Usage

```
sensOLS(delta1, df, est, se, alpha = 0.05, talpha)
```

Arguments

delta1	A numeric vector of values of the first sensitivity parameter. Default value seq(-.1, .1, .01). Not used for 2SLS estimator.
df, est, se	Degrees of freedom of the model; 2SLS estimate and its standard error.
alpha	Significance level. Default at 0.05.
talpha	If the interval is to be adjusted for model selection etc, the multiplicative factor to be used. Optional.

Details

See the description of [senslm](#).

Value

Returns an object of class "si".

An object of class "si" is essentially a matrix of two columns for the upper and lower sensitivity limits corresponding to the sensitivity parameters.

Note

Do not use this function by itself, use `senslm` function.

Author(s)

Bikram Karmakar

See Also

[senslm](#), [plot.si](#)

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