Package 'ManyIV'

February 22, 2021

Title Inference in Instrumental Variables Models with Many Instruments

Version 0.0.2

Description Calculate estimators and standard errors in a linear instrumental
variables model with possibly many instruments and many exogenous regressors
under homoskedasticity of the reduced form. Also computes
tests of overidentifying restrictions.

Depends R (>= 4.0.0)

License GPL-3

Encoding UTF-8

LazyData true

Imports Matrix,
stats,
Formula,
numDeriv

RoxygenNote 7.1.1

Suggests spelling,
testthat,
knitr,
rmarkdown

VignetteBuilder knitr

LazyLoad yes

Language en-US

BugReports https://github.com/kolesarm/ManyIV/issues

URL https://github.com/kolesarm/ManyIV

R topics documented:

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ak80   *Angrist and Krueger (1991) Census data*

Description

Sample of males born in the US in 1930-39 from 5 percent sample of the 1980 US Census

Usage

ak80

Format

A data frame with 329,509 observations on 10 variables:

age Age, measured at quarterly precision

education Years of education

lwage Log of weekly wage

married Indicator for being married

qob Quarter of birth

sob State of birth

black Indicator for being black

smsa SMSA indicator

yob Year of birth

division Census division

Source

Josh Angrist's website, http://economics.mit.edu/faculty/angrist/data1/data/angkru1991

References

Angrist, Joshua D., and Alan B. Krueger. 1991. "Does Compulsory School Attendance Affect Schooling and Earnings?" The Quarterly Journal of Economics 106 (4): 979–1014

IVoverid   *Test of overidentifying restrictions*

Description

Report the Sargan and modified Cragg-Donal test statistics and p-values for testing of overidentifying restrictions, assuming homoskedasticity of the reduced form. The Sargan test is valid under few instruments. The Modified Cragg-Donald test (Modified-CD) corresponds to a test due to Cragg and Donald (1993), with a modified critical value. The modification was suggested in Kolesár (2018) to make it robust to many instruments and many exogenous regressors.

Usage

```
IVoverid(r)
```

Arguments

r   object of class RDResults

References

Kolesár, Michal. Minimum Distance Approach to Inference with Many Instruments." *Journal of Econometrics 204 (1): 86–100*. https://doi.org/10.1016/j.jeconom.2018.01.004.

Cragg, John G., and Stephen G. Donald. 1993. "Testing Identifiability and Specification in Instrumental Variable Models." *Econometric Theory 9 (2): 222–40.* https://doi.org/10.1017/S0266466600007519.

Sargan, John Denis. 1958. "The Estimation of Economic Relationships Using Instrumental Variables." *Econometrica 26 (3): 393–415.* https://doi.org/10.2307/1907619.

Examples

```
r1 <- IVreg(lwage~education+black+married | as.factor(qob), data=ak80,
            inference="standard")
IVoverid(r1)
```

IVreg   *Instrumental Variables Regression*

Description

Fit instrumental variables regression by a number of methods, and compute associated standard errors, as specified by inference

Usage

```
IVreg(formula, data, subset, na.action, inference = "standard", approx = TRUE)
```

Arguments

formula	Specification of the regression relationship and the instruments of the form y ~ x + w1 + w2	z1 + z2 + z3, where y is the outcome variable, x is a scalar endogenous variable, w1, w2 are exogenous regressors, and z1, z2, and z3 are excluded instruments.
data	An optional data frame, list or environment (or object coercible by as.data.frame to a data frame) containing the variables in the model. If not found in data, the variables are taken from environment(formula), typically the environment from which the function is called.
subset	An optional vector specifying a subset of observations to be used in the fitting process.
na.action	A function indicating what should happen when the data contain NAs. The default is set by the na.action setting of options (usually na.omit).
inference	Vector specifying inference method(s). The elements of the vector can consist of the following methods:

> "standard" Report inference based on TSLS, LIML, and MBTSLS, along with homoskedastic and heteroskedasticity-robust standard errors, standard errors that are valid under heteroskedasticity and treatment effect heterogeneity. All three standard errors are valid under standard asymptotics only.
>
> "re" Report standard errors for LIML based on Hessian of random effects likelihood
>
> "il" Report standard errors for LIML based on Hessian of invariant likelihood, evaluated numerically
>
> "lil" Report standard errors for LIML based on the information matrix of limited information likelihood
>
> "md" Compute the EMD, LIML, and MBTSLS estimators, and report standard errors for LIML, MBTSLS, and EMD based on the minimum distance objective function proposed in Kolesár (2018)
>
> See the vignette vignette("ManyIV", package = "ManyIV") for a detailed description of these methods.

approx	if TRUE, then estimates of third and fourth moments used in inference based on the minimum distance objective function (inference="md") are based on an approximation to speed up the calculations.

Value

An object of class "IVResults", which is a list with the following components:

IVData An object of class "IVData", which is a list with at least the following components:

> **Z** Matrix of instruments
>
> **Y** Matrix with two columns collecting the endogenous variables
>
> **W** Matrix of exogenous regressors
>
> **n** Number of observations used, the number of rows of Z, W, or Yp
>
> **l** Dimension of the exogenous regressors, the number of columns of W
>
> **k** Dimension of the instruments, the number of columns of Z

F First-stage *F* statistic

call The matched call.

estimate A data frame containing the estimation results.

The `print` function can be used to print a summary of the results.

References

Kolesár, Michal. Minimum Distance Approach to Inference with Many Instruments." Journal of Econometrics 204 (1): 86–100.

Examples

```
## Use quarter of birth as an instrument for education, controlling for
## marriage and black indicators
IVreg(lwage~education+black+married | as.factor(qob),
         data=ak80, inference=c("standard", "re", "il", "lil"))
```

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