

Title

aprub — Estimate the upper bound on the average persuasion rate

Syntax

```
aprub depvar treatrvar instrvar [covariates] [if] [in] [,  
model(string) title(string)]
```

Options

<i>option</i>	<i>Description</i>
model (<i>string</i>)	Regression model when <i>covariates</i> are present
title (<i>string</i>)	Title

Description

aprub estimates the upper bound on the average persuasion rate (APR). *varlist* should include *depvar treatrvar instrvar covariates* in order. Here, *depvar* is binary outcomes (*y*), *treatrvar* is binary treatment (*t*), *instrvar* is binary instruments (*z*), and *covariates* (*x*) are optional.

There are two cases: (i) *covariates* are absent and (ii) *covariates* are present.

- Without *x*, the upper bound (**theta_U**) on the APR is defined by

$$\mathbf{theta_U} = \{E[A|z=1] - E[B|z=0]\} / \{1 - E[B|z=0]\},$$

where $A = 1(y=1, t=1) + 1 - 1(t=1)$ and $B = 1(y=1, t=0)$.

The estimate and its standard error are obtained by the following procedure:

1. $E[A|z=1]$ is estimated by regressing *A* on *z*.
2. $E[B|z=0]$ is estimated by regressing *B* on *z*.
3. **theta_U** is computed using the estimates obtained above.
4. The standard error is computed via STATA command **nlcom**.

- With x , the upper bound (**theta_U**) on the APR is defined by

$$\mathbf{theta_U} = E[\mathbf{theta_U_num}(x)] / E[\mathbf{theta_U_den}(x)],$$

where

$$\mathbf{theta_U_num}(x) = E[A|z=1,x] - E[B|z=0,x]$$

and

$$\mathbf{theta_U_den}(x) = 1 - E[B|z=0,x].$$

The estimate is obtained by the following procedure.

If **model**("no_interaction") is selected (default choice),

1. $E[A|z=1,x]$ is estimated by regressing A on z and x .
2. $E[B|z=0,x]$ is estimated by regressing B on z and x .

Alternatively, if **model**("interaction") is selected,

1. $E[A|z=1,x]$ is estimated by regressing A on x given $z = 1$.
2. $E[B|z=0,x]$ is estimated by regressing B on x given $z = 0$.

After step 1, both options are followed by:

3. For each x in the estimation sample, **theta_U_num**(x) and **theta_U_den**(x) are evaluated.
4. The estimates of **theta_U_num**(x) and **theta_U_den**(x) are averaged to estimate **theta_U**.

When *covariates* are present, the standard error is missing because an analytic formula for the standard error is complex. Bootstrap inference is implemented when this package's command **persuasio** is called to conduct inference.

Options

model(*string*) specifies a regression model.

This option is only relevant when x is present. The dependent variable is either A or B . The default option is "no_interaction" between z and x . When "interaction" is selected, full interactions between z and x are allowed.

title(*string*) specifies a title.

Remarks

It is recommended to use this package's command **persuasio** instead of calling **aprub** directly.

Examples

We first call the dataset included in the package.

```
. use GKB_persuasio, clear
```

The first example estimates the upper bound on the APR without covariates.

```
. aprub voteddem_all readsome post
```

The second example adds a covariate.

```
. aprub voteddem_all readsome post MZwave2
```

The third example estimates the upper bound by the covariate.

```
. by MZwave2,sort: aprub voteddem_all readsome post
```

Stored results

Scalars

e(N): sample size

e(ub_coef): estimate of the upper bound on the average persuasion rate

e(ub_se): standard error of the upper bound on the average persuasion rate

Macros

e(outcome): variable name of the binary outcome variable

e(treatment): variable name of the binary treatment variable

e(instrument): variable name of the binary instrumental variable

e(covariates): variable name(s) of the covariates if they exist

e(model): regression model specification ("no_interaction" or "interaction")

Functions:

e(sample): 1 if the observations are used for estimation, and 0 otherwise.

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References

Sung Jae Jun and Sokbae Lee (2022), Identifying the Effect of Persuasion, [arXiv:1812.02276](https://arxiv.org/abs/1812.02276) [[econ.EM](https://econ.em.berkeley.edu/)].

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