Title

> **ivprobit postestimation** — Postestimation tools for ivprobit

Postestimation commands

The following postestimation commands are of special interest after `ivprobit`:

Command	Description
estat classification	report various summary statistics, including the classification table
estat correlation	report the correlation matrix of the errors of the dependent variable and the endogenous variables
estat covariance	report the covariance matrix of the errors of the dependent variable and the endogenous variables
lroc	compute area under ROC curve and graph the curve
lsens	graph sensitivity and specificity versus probability cutoff

These commands are not appropriate after the two-step estimator or the `svy` prefix.

The following standard postestimation commands are also available:

Command	Description
contrast	contrasts and ANOVA-style joint tests of estimates
* estat ic	Akaike's and Schwarz's Bayesian information criteria (AIC and BIC)
estat summarize	summary statistics for the estimation sample
estat vce	variance–covariance matrix of the estimators (VCE)
estat (svy)	postestimation statistics for survey data
estimates	cataloging estimation results
*† forecast	dynamic forecasts and simulations
† hausman	Hausman's specification test
lincom	point estimates, standard errors, testing, and inference for linear combinations of coefficients
† lrtest	likelihood-ratio test; not available with two-step estimator
margins	marginal means, predictive margins, marginal effects, and average marginal effects
marginsplot	graph the results from margins (profile plots, interaction plots, etc.)
nlcom	point estimates, standard errors, testing, and inference for nonlinear combinations of coefficients
predict	predictions, residuals, influence statistics, and other diagnostic measures
predictnl	point estimates, standard errors, testing, and inference for generalized predictions
pwcompare	pairwise comparisons of estimates
* suest	seemingly unrelated estimation
test	Wald tests of simple and composite linear hypotheses
testnl	Wald tests of nonlinear hypotheses

* `estat ic`, `forecast`, and `suest` are not appropriate after `ivprobit, twostep`.

† `forecast`, `hausman`, and `lrtest` are not appropriate with svy estimation results.

predict

Description for predict

predict creates a new variable containing predictions such as linear predictions, standard errors, and probabilities.

Menu for predict

Statistics > Postestimation

Syntax for predict

After ML or twostep

> predict [*type*] *newvar* [*if*] [*in*] [, *statistic* <u>rule</u>s asif]

After ML

> predict [*type*] { *stub* * | *newvarlist* } [*if*] [*in*] , <u>sc</u>ores

statistic	Description
Main	
xb	linear prediction; the default
stdp	standard error of the linear prediction
<u>pr</u>	probability of a positive outcome accounting for endogeneity; not available with two-step estimator

These statistics are available both in and out of sample; type predict ... if e(sample) ... if wanted only for the estimation sample.

Options for predict

⌐ Main ⌐

xb, the default, calculates the linear prediction.

stdp calculates the standard error of the linear prediction.

pr calculates the probability of a positive outcome accounting for endogeneity. pr is not available with the two-step estimator.

rules requests that Stata use any rules that were used to identify the model when making the prediction. By default, Stata calculates missing for excluded observations. rules is not available with the two-step estimator.

asif requests that Stata ignore the rules and the exclusion criteria and calculate predictions for all observations possible using the estimated parameters from the model. asif is not available with the two-step estimator.

scores, not available with twostep, calculates equation-level score variables.

For models with one endogenous regressor, four new variables are created.

The first new variable will contain $\partial \ln L / \partial (z_i \delta)$.

The second new variable will contain $\partial \ln L / \partial (x_i \Pi)$.

The third new variable will contain $\partial \ln L / \partial$ atanh ρ.

The fourth new variable will contain $\partial \ln L / \partial \ln \sigma$.

For models with p endogenous regressors, $p + \{(p+1)(p+2)\}/2$ new variables are created.

The first new variable will contain $\partial \ln L / \partial (z_i \delta)$.

The second through $(p+1)$th new variables will contain $\partial \ln L / \partial (x_i \Pi_k)$, $k = 1, \ldots, p$, where Π_k is the kth column of Π.

The remaining score variables will contain the partial derivatives of $\ln L$ with respect to s_{21}, s_{31}, $\ldots$, $s_{p+1,1}$, s_{22}, $\ldots$, $s_{p+1,2}$, $\ldots$, $s_{p+1,p+1}$, where $s_{m,n}$ denotes the (m, n) element of the Cholesky decomposition of the error covariance matrix.

margins

Description for margins

margins estimates margins of response for linear predictions and probabilities.

Menu for margins

Statistics > Postestimation

Syntax for margins

> margins [*marginlist*] [, *options*]
>
> margins [*marginlist*] , <u>pred</u>ict(*statistic* ...) [<u>pred</u>ict(*statistic* ...) ...] [*options*]

statistic	Description
Main	
xb	linear prediction; the default
<u>pr</u>	probability of a positive outcome accounting for endogeneity; not available with two-step estimator
stdp	not allowed with margins

Statistics not allowed with margins are functions of stochastic quantities other than e(b).

For the full syntax, see [R] **margins**.

estat

Description for estat

estat correlation displays the correlation matrix of the errors of the dependent variable and the endogenous variables.

estat covariance displays the covariance matrix of the errors of the dependent variable and the endogenous variables.

estat correlation and estat covariance are not allowed after the ivprobit two-step estimator.

Menu for estat

Statistics > Postestimation

Syntax for estat

Correlation matrix

    estat <u>corr</u>elation [, <u>bor</u>der(*bspec*) left(*#*) <u>for</u>mat(*%fmt*)]

Covariance matrix

    estat <u>corr</u>elation [, <u>bor</u>der(*bspec*) left(*#*) <u>for</u>mat(*%fmt*)]

Options for estat

> Main

border(*bspec*) sets border style of the matrix display. The default is border(all).

left(*#*) sets the left indent of the matrix display. The default is left(2).

format(*%fmt*) specifies the format for displaying the individual elements of the matrix. The default is format(%9.0g).

Remarks and examples

Remarks are presented under the following headings:

        Marginal effects
        Obtaining predicted values

Marginal effects

▷ Example 1

We can obtain marginal effects by using the `margins` command after `ivprobit`. We will calculate average marginal effects by using the labor-supply model of example 1 in [R] **ivprobit**.

```
. use http://www.stata-press.com/data/r15/laborsup
. ivprobit fem_work fem_educ kids (other_inc = male_educ)
  (output omitted )
. margins, dydx(*) predict(pr)
Average marginal effects                        Number of obs    =       500
Model VCE    : OIM
Expression   : Probability of positive outcome, predict(pr)
dy/dx w.r.t. : other_inc fem_educ kids male_educ
```

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
other_inc	-.0097802	.0014994	-6.52	0.000	-.012719	-.0068414
fem_educ	.0623273	.007099	8.78	0.000	.0484135	.076241
kids	-.0614265	.0139446	-4.41	0.000	-.0887574	-.0340956
male_educ	-.0194406	.0022103	-8.80	0.000	-.0237728	-.0151084

Here we see that a \$1,000 increase in `other_inc` leads to an average decrease of 0.01 in the probability that the woman has a job. `male_edu` has no effect because it appears only as an instrument.

◁

Obtaining predicted values

After fitting your model with `ivprobit`, you can obtain the linear prediction and its standard error for both the estimation sample and other samples by using the `predict` command; see [U] **20 Estimation and postestimation commands** and [R] **predict**. If you had used the maximum likelihood estimator, you could also obtain the probability of a positive outcome.

`predict`'s `pr` option calculates the probability of a positive outcome, remembering any rules used to identify the model, and calculates missing for excluded observations. `predict`'s `rules` option uses the rules in predicting probabilities, whereas `predict`'s `asif` option ignores both the rules and the exclusion criteria and calculates probabilities for all possible observations by using the estimated parameters from the model. See *Obtaining predicted values* in [R] **probit postestimation** for an example.

Methods and formulas

The linear prediction is calculated as $z_i\widehat{\delta}$, where $\widehat{\delta}$ is the estimated value of δ, and z_i and δ are defined in (1a) of [R] **ivprobit**. The probability of a positive outcome is $\Phi(m_i)$, where $\Phi(\cdot)$ is the standard normal distribution function and m_i is defined in *Methods and formulas* of [R] **ivprobit**. Using m_i instead of $z_i\widehat{\delta}$ to evaluate $\Phi(\cdot)$ accounts for endogeneity.

Also see

[R] **ivprobit** — Probit model with continuous endogenous covariates

[R] **estat classification** — Classification statistics and table

[R] **lroc** — Compute area under ROC curve and graph the curve

[R] **lsens** — Graph sensitivity and specificity versus probability cutoff

[U] **20 Estimation and postestimation commands**