

**eoprobit postestimation** — Postestimation tools for eoprobit and xteoprobit

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## Postestimation commands

The following postestimation command is of special interest after `eoprobit` and `xteoprobit`:

Command	Description
<code>estat teffects</code>	treatment effects and potential-outcome means

The following standard postestimation commands are also available after `eoprobit` and `xteoprobit`:

Command	Description
<code>contrast</code>	contrasts and ANOVA-style joint tests of estimates
<code>estat ic</code>	Akaike's, consistent Akaike's, corrected Akaike's, and Schwarz's Bayesian information criteria (AIC, CAIC, AICC, and BIC)
<code>estat summarize</code>	summary statistics for the estimation sample
<code>estat vce</code>	variance–covariance matrix of the estimators (VCE)
<sup>†</sup> <code>estat (svy)</code>	postestimation statistics for survey data
<code>estimates</code>	cataloging estimation results
<code>etable</code>	table of estimation results
* <code>forecast</code>	dynamic forecasts and simulations
* <code>hausman</code>	Hausman's specification test
<code>lincom</code>	point estimates, standard errors, testing, and inference for linear combinations of coefficients
* <code>lrtest</code>	likelihood-ratio test
<code>margins</code>	marginal means, predictive margins, marginal effects, and average marginal effects
<code>marginsplot</code>	graph the results from margins (profile plots, interaction plots, etc.)
<code>nlcom</code>	point estimates, standard errors, testing, and inference for nonlinear combinations of coefficients
<code>predict</code>	means, probabilities, treatment effects, etc.
<code>predictnl</code>	point estimates, standard errors, testing, and inference for generalized predictions
<code>pwcompare</code>	pairwise comparisons of estimates
<sup>†</sup> <code>suest</code>	seemingly unrelated estimation
<code>test</code>	Wald tests of simple and composite linear hypotheses
<code>testnl</code>	Wald tests of nonlinear hypotheses

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

<sup>†</sup>`suest` and the survey data `estat` commands are not available after `xteoprobit`.

## predict

Predictions after eoprobit and xteoprobit are described in

[ERM] <b>eoprobit predict</b>	predict after eoprobit and xteoprobit
[ERM] <b>predict treatment</b>	predict for treatment statistics
[ERM] <b>predict advanced</b>	predict's advanced features

[ERM] **eoprobit predict** describes the most commonly used predictions. If you fit a model with treatment effects, predictions specifically related to these models are detailed in [ERM] **predict treatment**. [ERM] **predict advanced** describes less commonly used predictions, such as predictions of outcomes in auxiliary equations.

## margins

### Description for margins

`margins` estimates statistics based on fitted models. These statistics include marginal means, marginal probabilities, potential-outcome means, average and conditional derivatives, average and conditional effects, and treatment effects.

### Menu for margins

Statistics > Postestimation

### Syntax for margins

```
margins [marginlist] [, options]
```

```
margins [marginlist] , predict(statistic ...) [predict(statistic ...) ...] [options]
```

<i>statistic</i>	Description
Main	
<code>pr</code>	probability for binary or ordinal $y_j$ ; the default
<code><u>m</u>ean</code>	mean
<code><u>p</u>omean</code>	potential-outcome mean
<code><u>t</u>e</code>	treatment effect
<code><u>t</u>et</code>	treatment effect on the treated
<code><u>x</u>b</code>	linear prediction excluding all complications
<code>pr(<i>a</i>,<i>b</i>)</code>	$\Pr(a < y_j < b)$ for continuous $y_j$
<code>e(<i>a</i>,<i>b</i>)</code>	$E(y_j   a < y_j < b)$ for continuous $y_j$
<code><u>y</u>star(<i>a</i>,<i>b</i>)</code>	$E(y_j^*)$ , $y_j^* = \max\{a, \min(y_j, b)\}$ for continuous $y_j$

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

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

## Remarks and examples

See [ERM] [Intro 7](#) for an overview of using margins and predict after eoprobit and xteoprobit. For examples using margins, predict, and estat teffects, see *Interpreting effects* in [ERM] [Intro 9](#) and see [ERM] [Example 1a](#).

## Methods and formulas

This section contains methods and formulas for the default `asf` prediction. Methods and formulas for other predictions are given in *Methods and formulas* of [ERM] [eoprobit](#). We begin with the cross-sectional model, and then we extend our discussion to the random-effect models that we use for panel data.

In the ordered probit model for exogenous covariates  $\mathbf{x}_i$  and endogenous regressors  $\mathbf{w}_i$ , we have

$$y_i = v_h \quad \text{iff} \quad \kappa_{h-1} < \mathbf{x}_i\boldsymbol{\beta} + \mathbf{w}_i\boldsymbol{\beta}_2 + \epsilon_i \leq \kappa_h$$

The values  $v_1, \dots, v_H$  are real numbers such that  $v_h < v_m$  for  $h < m$ .  $\kappa_0$  is taken as  $-\infty$  and  $\kappa_H$  is taken as  $+\infty$ . The error  $\epsilon_i$  is standard normal and correlated with  $\mathbf{w}_i$ .

Because  $\epsilon_i$  is a normally distributed, mean 0, random variable, we can split it into two mean 0, normally distributed, independent parts,

$$\epsilon_i = u_i + \psi_i$$

where  $u_i = \gamma\epsilon_{2i}$  is the unobserved heterogeneity that gives rise to the endogeneity and  $\psi_i$  is an idiosyncratic error term with variance  $\sigma_\psi^2$ .

For  $h = 0, \dots, H$ , define

$$c_{ih} = \begin{cases} -\infty & h = 0 \\ \kappa_h - \mathbf{x}_i\boldsymbol{\beta} - \mathbf{w}_i\boldsymbol{\beta}_2 - u_i & h = 1, \dots, H - 1 \\ \infty & h = H \end{cases}$$

Conditional on the covariates and the unobserved heterogeneity, we have

$$\begin{aligned} E\{\mathbf{1}(y_i = v_h) | \mathbf{x}_i, \mathbf{w}_i, u_i\} &= \Pr(y_i = v_h | \mathbf{x}_i, \mathbf{w}_i, u_i) \\ &= \Phi_1^*(c_{i(h-1)}, c_{ih}, \sigma_\psi^2) \end{aligned}$$

Predictions and effects are computed based on the expression above. Including  $u_i$  controls for endogeneity. Thus, all effects computed using the expression above have a structural interpretation. See [Imbens and Newey \(2009\)](#) and [Wooldridge \(2010\)](#) for a detailed description of structural functions for models with endogeneity.

Our discussion easily extends to models for panel data with random effects. In this case, we have  $N$  panels. Panel  $i = 1, \dots, N$  has observations  $t = 1, \dots, N_i$ , so we observe  $y_{it}$  with random effect  $\alpha_i$  and observation-level error  $\epsilon_{it}$ . These errors are independent of each other. So the combined error  $\xi_{it} = \alpha_i + \epsilon_{it}$  is normal with mean 0 and variance  $1 + \sigma_\alpha^2$ , where  $\sigma_\alpha^2$  is the variance of  $\alpha_i$ . The results discussed earlier can then be applied using the combined error  $\xi_{it}$  rather than the cross-sectional error.

All predictions after **xteoprobit** assume the panel-level random effects ( $\alpha_i$ ) are zero. Put another way, predictions condition on the random effects being set to their means.

## References

- Imbens, G. W., and W. K. Newey. 2009. Identification and estimation of triangular simultaneous equations models without additivity. *Econometrica* 77: 1481–1512. <https://doi.org/10.3982/ECTA7108>.
- Wooldridge, J. M. 2010. *Econometric Analysis of Cross Section and Panel Data*. 2nd ed. Cambridge, MA: MIT Press.

## Also see

- [ERM] **eoprobit** — Extended ordered probit regression
- [ERM] **eoprobit predict** — predict after eoprobit and xteoprobit
- [ERM] **predict treatment** — predict for treatment statistics
- [ERM] **predict advanced** — predict’s advanced features
- [ERM] **eoprobit postestimation** — Postestimation tools for eoprobit and xteoprobit
- [U] **20 Estimation and postestimation commands**

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