Title

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eoprobit postestimation — Postestimation tools for eoprobit and xteoprobit

Postestimation commands

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

Command	Description
`estat teffects`	treatment effects and potential-outcome means

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

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
`etable`	table of 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
`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`	means, probabilities, treatment effects, etc.
`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

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

† `suest` and the survey data `estat` commands are not available after `xteoprobit`.

predict

Predictions after `eoprobit` and `xteoprobit` are described in

[ERM] **eoprobit predict**	predict after eoprobit and xteoprobit
[ERM] **predict treatment**	predict for treatment statistics
[ERM] **predict advanced**	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*]

statistic	Description
Main	
`pr`	probability for binary or ordinal y_j; the default
`mean`	mean
`pomean`	potential-outcome mean
`te`	treatment effect
`tet`	treatment effect on the treated
`xb`	linear prediction excluding all complications
`pr(`a`,`b`)`	$\Pr(a < y_j < b)$ for continuous y_j
`e(`a`,`b`)`	$E(y_j \mid a < y_j < b)$ for continuous y_j
`ystar(`a`,`b`)`	$E(y_j^*)$, $y_j^* = \max\{a, \min(y_j, b)\}$ 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

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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 $v_1, \ldots, v_H$ are real numbers such that $v_h < v_m$ for $h < m$. κ_0 is taken as $-\infty$ and κ_H is taken as $+\infty$. The error ϵ_i is standard normal and correlated with $\mathbf{w}_i$.

Because ϵ_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 $u_i = \boldsymbol{\gamma}\boldsymbol{\epsilon}_{2i}$ is the unobserved heterogeneity that gives rise to the endogeneity and ψ_i is an idiosyncratic error term with variance σ^2_ψ.

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

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

Conditional on the covariates and the unobserved heterogeneity, we have

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

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 $i = 1, \ldots, N$ has observations $t = 1, \ldots, N_i$, so we observe y_{it} with random effect α_i and observation-level error ϵ_{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 $1 + \sigma^2_\alpha$, where σ^2_α is the variance of α_i. The results discussed earlier can then be applied using the combined error ξ_{it} rather than the cross-sectional error.

All predictions after `xteoprobit` assume the panel-level random effects (α_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] **eprobit postestimation** — Postestimation tools for eprobit and xteprobit

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