Postestimation commands

The following postestimation commands are available after `slogit`:

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

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

Description for predict

predict creates a new variable containing predictions such as probabilities, indexes for the $k$th outcome, and standard errors.

Menu for predict

Statistics > Postestimation

Syntax for predict

```
predict [type] { stub* | newvar | newvarlist } [if] [in] [, statistic outcome(outcome)]

predict [type] stub* [if] [in], scores
```

**statistic**

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>pr</td>
</tr>
<tr>
<td>xb</td>
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<tr>
<td>stdp</td>
</tr>
</tbody>
</table>

You specify one or $k$ new variables with `pr`, where $k$ is the number of outcomes. If you specify one new variable and you do not specify `outcome()`, then `outcome(#1)` is assumed.

You specify one new variable with `xb` and `stdp`. If you do not specify `outcome()`, then `outcome(#1)` is assumed.

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

- **pr**, the default, computes the predicted probabilities for all outcomes or for a specific outcome. To compute probabilities for all outcomes, you specify $k$ new variables, where $k$ is the number of categories of the dependent variable. Alternatively, you can specify `stub*`; in which case, `pr` will store predicted probabilities in variables `stub1`, `stub2`, ..., `stubk`. To compute the probability for a specific outcome, you specify one new variable and, optionally, the outcome value in option `outcome()`; if you omit `outcome()`, the first outcome value, `outcome(#1)`, is assumed.

Say that you fit a model by typing `estimation_cmd y x1 x2`, and $y$ takes on four values. Then, you could type `predict p1 p2 p3 p4` to obtain all four predicted probabilities; alternatively, you could type `predict p*` to generate the four predicted probabilities. To compute specific probabilities one at a time, you can type `predict p1, outcome(#1)` (or simply `predict p1`), `predict p2, outcome(#2)`, and so on. See option `outcome()` for other ways to refer to outcome values.

- `xb` calculates the index, $\theta_k = \sum_{j=1}^d \phi_{jk}x_j\beta_j$, for outcome level $k \neq e(i\_base)$ and dimension $d = e(k\_dim)$. It returns a vector of zeros if $k = e(i\_base)$. A synonym for `xb` is `index`. If `outcome()` is not specified, `outcome(#1)` is assumed.

- `stdp` calculates the standard error of the index. A synonym for `stdp` is `seindex`. If `outcome()` is not specified, `outcome(#1)` is assumed.
outcome(outcome) specifies for which outcome the predicted probabilities are to be calculated. outcome() should contain either one value of the dependent variable or one of \#1, \#2, ..., with \#1 meaning the first category of the dependent variable, \#2 meaning the second category, etc. outcome() is not allowed with scores.

scores calculates the equation-level score variables. For models with \( d \) dimensions and \( m \) levels, 
\( d + (d + 1)(m - 1) \) new variables are created. Assume \( j = 1, \ldots, d \) and \( k = 1, \ldots, m \) in the following.

The first \( d \) new variables will contain \( \partial \ln L / \partial (x \beta_j) \).

The next \( d(m - 1) \) new variables will contain \( \partial \ln L / \partial \phi_{jk} \).

The last \( m - 1 \) new variables will contain \( \partial \ln L / \partial \theta_k \).

margins

Description for margins

margins estimates margins of response for probabilities and indexes for the \( k \)th outcome.

Menu for margins

Statistics > Postestimation

Syntax for margins

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

<table>
<thead>
<tr>
<th>statistic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>default</td>
<td>probabilities for each outcome</td>
</tr>
<tr>
<td>pr</td>
<td>probability of one of or all the dependent variable outcomes</td>
</tr>
<tr>
<td>xb</td>
<td>index for the ( k )th outcome</td>
</tr>
<tr>
<td>stdp</td>
<td>not allowed with margins</td>
</tr>
</tbody>
</table>

pr and xb default to the first outcome.

Statistics not allowed with margins are functions of stochastic quantities other than \( e(b) \). For the full syntax, see [R] margins.

Remarks and examples

Once you have fit a stereotype logistic model, you can obtain the predicted probabilities by using the predict command for both the estimation sample and other samples; see [U] 20 Estimation and postestimation commands and [R] predict.
predict without arguments (or with the pr option) calculates the predicted probability of each outcome of the dependent variable. You must therefore give a new variable name for each of the outcomes. To compute the estimated probability of one outcome, you use the outcome(outcome) option where outcome is the level encoding the outcome. If the dependent variable’s levels are labeled, the outcomes can also be identified by the label values (see [D] label).

The xb option in conjunction with outcome(outcome) specifies that the index be computed for the outcome encoded by level outcome. Its approximate standard error is computed if the stdp option is specified. Only one of the pr, xb, or stdp options can be specified with a call to predict.

Example 1

In example 2 of [R] slogit, we fit the one-dimensional stereotype model, where the depvar is insure with levels $k = 1$ for outcome Indemnity, $k = 2$ for Prepaid, and $k = 3$ for Uninsure. The base outcome for the model is Indemnity, so for $k \neq 1$ the vector of indices for the $k$th level is

$$
\eta_k = \theta_k - \phi_k (\beta_1 \text{age} + \beta_2 \text{male} + \beta_3 \text{nonwhite} + \beta_4 2.\text{site} + \beta_5 3.\text{site})
$$

We estimate the group probabilities by calling predict after slogit.

```
use https://www.stata-press.com/data/r17/sysdsn1
(Health insurance data)
slogit insure age male nonwhite i.site, dim(1) base(1) nolog
(output omitted)
predict pIndemnity pPrepaid pUninsure, p
list pIndemnity pPrepaid pUninsure insure in 1/10

     pIndemnity  pPrepaid  pUnins--e    insure
      -------------  --------  --------  ----
     1.     .5419344  .3754875  .0825782   Indemnity
     2.     .4359638  .496328   .0677081    Prepaid
     3.     .5111583  .4105107  .0783309   Indemnity
     4.     .3941132  .5442234  .0616633    Prepaid
     5.     .4655651  .4625064  .0719285
     6.     .4401779  .4915102  .0683118    Prepaid
     7.     .4632222  .4651931  .0715948    Prepaid
     8.     .3772302  .5635696  .0592002
     9.     .4867758  .4383018  .0749225  Uninsure
    10.     .5823668  .3295802  .0880531    Prepaid
```

Observations 5 and 8 are not used to fit the model because insure is missing at these points, but predict estimates the probabilities for these observations because none of the independent variables is missing. You can use if e(sample) in the call to predict to use only those observations that are used to fit the model.

Methods and formulas

predict

Let level $b$ be the base outcome that is used to fit the stereotype logistic regression model of dimension $d$. The index for observation $i$ and level $k \neq b$ is $\eta_{ik} = \theta_k - \sum_{j=1}^{d} \phi_{jk} x_i \beta_j$. This is the log odds of outcome encoded as level $k$ relative to that of $b$ so that we define $\eta_{ib} \equiv 0$. The outcome probabilities for this model are defined as $Pr(Y_i = k) = e^{\eta_{ik}} / \sum_{j=1}^{m} e^{\eta_{ij}}$. Unlike in mlogit, ologit, and oprobit, the index is no longer a linear function of the parameters. The standard error of index $\eta_{ik}$ is thus computed using the delta method (see also [R] predictnl).
The equation-level score for regression coefficients is

\[
\frac{\partial \ln L_{ik}}{\partial x_i \beta_j} = \left( \sum_{l=1}^{m-1} \phi_{jl} p_{il} - \phi_{jk} \right)
\]

the equation-level score for the scale parameters is

\[
\frac{\partial \ln L_{ik}}{\partial \phi_{jl}} = \begin{cases} 
    x_i \beta_j (p_{ik} - 1), & \text{if } l = k \\
    x_i \beta_j p_{il}, & \text{if } l \neq k
\end{cases}
\]

for \( l = 1, \ldots, m - 1 \); and the equation-level score for the intercepts is

\[
\frac{\partial \ln L_{ik}}{\partial \theta_l} = \begin{cases} 
    1 - p_{ik}, & \text{if } l = k \\
    - p_{il}, & \text{if } l \neq k
\end{cases}
\]

Also see

[R] slogit — Stereotype logistic regression
[U] 20 Estimation and postestimation commands