Title

xtpoisson postestimation — Postestimation tools for xtpoisson

Description

The following postestimation commands are available for `xtpoisson`:

command	description
* `estat`	AIC, BIC, VCE, and estimation sample summary
`estimates`	cataloging estimation results
`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
`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
`test`	Wald tests of simple and composite linear hypotheses
`testnl`	Wald tests of nonlinear hypotheses

* `estat ic` is not appropriate after `xtpoisson, pa`.

See the corresponding entries in the *Base Reference Manual* for details.

Syntax for predict

Random-effects (RE) and fixed-effects (FE) models

`predict` [*type*] *newvar* [*if*] [*in*] [, *RE/FE_statistic* `nooffset`]

Population-averaged (PA) model

`predict` [*type*] *newvar* [*if*] [*in*] [, *PA_statistic* `nooffset`]

RE/FE_statistic	description
Main	
`xb`	linear prediction; the default
`stdp`	standard error of the linear prediction
`nu0`	predicted number of events; assumes fixed or random effect is zero
`iru0`	predicted incidence rate; assumes fixed or random effect is zero
`pr0(`*n*`)`	probability $\Pr(y_j = n)$ assuming the random effect is zero; only allowed after `xtpoisson, re`
`pr0(`*a*`,`*b*`)`	probability $\Pr(a \le y_j \le b)$ assuming the random effect is zero; only allowed after `xtpoisson, re`

PA_statistic	description
Main	
`mu`	predicted number of events; considers the `offset()`; the default
`rate`	predicted number of events
`xb`	linear prediction
`pr(`n`)`	probability $\Pr(y_j = n)$
`pr(`a`,`b`)`	probability $\Pr(a \leq y_j \leq b)$
`stdp`	standard error of the linear prediction
`score`	first derivative of the log likelihood with respect to $\mathbf{x}_j\boldsymbol{\beta}$

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

Menu

Statistics > Postestimation > Predictions, residuals, etc.

Options for predict

Main

`xb` calculates the linear prediction. This is the default for the random-effects and fixed-effects models.

`mu` and `rate` both calculate the predicted number of events. `mu` takes into account the `offset()`, and `rate` ignores those adjustments. `mu` and `rate` are equivalent if you did not specify `offset()`. `mu` is the default for the population-averaged model.

`stdp` calculates the standard error of the linear prediction.

`nu0` calculates the predicted number of events, assuming a zero random or fixed effect.

`iru0` calculates the predicted incidence rate, assuming a zero random or fixed effect.

`pr0(`n`)` calculates the probability $\Pr(y_j = n)$ assuming the random effect is zero, where n is a nonnegative integer that may be specified as a number or a variable (only allowed after `xtpoisson, re`).

`pr0(`a`,`b`)` calculates the probability $\Pr(a \leq y_j \leq b)$ assuming the random effect is zero, where a and b are nonnegative integers that may be specified as numbers or variables (only allowed after `xtpoisson, re`);

b missing ($b \geq .$) means $+\infty$;
`pr0(20,.)` calculates $\Pr(y_j \geq 20)$;
`pr0(20,`b`)` calculates $\Pr(y_j \geq 20)$ in observations for which $b \geq .$ and calculates $\Pr(20 \leq y_j \leq b)$ elsewhere.

`pr0(.,`b`)` produces a syntax error. A missing value in an observation of the variable a causes a missing value in that observation for `pr0(`a`,`b`)`.

`pr(`n`)` calculates the probability $\Pr(y_j = n)$, where n is a nonnegative integer that may be specified as a number or a variable (only allowed after `xtpoisson, pa`).

`pr(`a`,`b`)` calculates the probability $\Pr(a \leq y_j \leq b)$ (only allowed after `xtpoisson, pa`). The syntax for this option is analogous to that used with `pr0(`a`,`b`)`.

`score` calculates the equation-level score, $u_j = \partial \ln L_j(\mathbf{x}_j\boldsymbol{\beta})/\partial(\mathbf{x}_j\boldsymbol{\beta})$.

`nooffset` is relevant only if you specified `offset(`*varname*`)` for `xtpoisson`. It modifies the calculations made by `predict` so that they ignore the offset variable; the linear prediction is treated as $\mathbf{x}_{it}\boldsymbol{\beta}$ rather than $\mathbf{x}_{it}\boldsymbol{\beta} + \text{offset}_{it}$.

Remarks

▷ Example 1

In example 1 of [XT] **xtpoisson**, we fit a random-effects model of the number of accidents experienced by five different types of ships on the basis of when the ships were constructed and operated. Here we obtain the predicted number of accidents for each observation, assuming that the random effect for each panel is zero:

```
. use http://www.stata-press.com/data/r11/ships
. xtpoisson accident op_75_79 co_65_69 co_70_74 co_75_79, exposure(service) irr
  (output omitted)
. predict n_acc, nu0
(6 missing values generated)
. summarize n_acc
```

Variable	Obs	Mean	Std. Dev.	Min	Max
n_acc	34	13.52307	23.15885	.0617592	83.31905

From these results, you may be tempted to conclude that some types of ships are safe, with a predicted number of accidents close to zero, whereas others are dangerous, because 1 observation is predicted to have more than 83 accidents.

However, when we fit the model, we specified the `exposure(service)` option. The variable `service` records the total number of months of operation for each type of ship constructed in and operated during particular years. Because ships experienced different utilization rates and thus were exposed to different levels of accident risk, we included `service` as our exposure variable. When comparing different types of ships, we must therefore predict the number of accidents, assuming that all ships faced the same exposure to risk. To do that, we use the `iru0` option with `predict`:

```
. predict acc_rate, iru0
. summarize acc_rate
```

Variable	Obs	Mean	Std. Dev.	Min	Max
acc_rate	40	.002975	.0010497	.0013724	.0047429

These results show that if each ship were used for 1 month, the expected number of accidents is 0.002975. Depending on the type of ship and years of construction and operation, the *incidence rate* of accidents ranges from 0.00137 to 0.00474.

◁

Methods and formulas

All postestimation commands listed above are implemented as ado-files.

The probabilities calculated using the `pr0(`*n*`)` option are the probability $\Pr(y_i = n)$ for a RE model assuming the random effect is zero. These are calculated using

$$\Pr(0|\mathbf{x}_i) = \omega_i + (1-\omega_i)p_2(0|\mathbf{x}_i)$$
$$\Pr(n|\mathbf{x}_i) = (1-\omega_i)p_2(n|\mathbf{x}_i) \qquad \text{for } n = 1, 2, \ldots$$

where ω_i is the probability of obtaining an observation from the degenerate distribution whose mass is concentrated at zero, and $p_2(n|\mathbf{x}_i)$ is the probability of $y_i = n$ from the nondegenerate, Poisson, RE model. ω_i can be obtained from the `pr0()` option.

Similarly, the probabilities calculated using the `pr(`*n*`)` option are the probability $\Pr(y_i = n)$ for a PA model assuming averaged effects are zero. These are calculated using

$$\Pr(0|\mathbf{x}_i) = \omega_i + (1-\omega_i)p_2(0|\mathbf{x}_i)$$
$$\Pr(n|\mathbf{x}_i) = (1-\omega_i)p_2(n|\mathbf{x}_i) \qquad \text{for } n = 1, 2, \ldots$$

where ω_i is the probability of obtaining an observation from the degenerate distribution whose mass is concentrated at zero, and $p_2(n|\mathbf{x}_i)$ is the probability of $y_i = n$ from the nondegenerate, Poisson, PA model. ω_i can be obtained from the `pr()` option.

See Cameron and Trivedi (1998, sec. 4.7) for further details.

Reference

Cameron, A. C., and P. K. Trivedi. 1998. *Regression Analysis of Count Data*. Cambridge: Cambridge University Press.

Also see

[XT] **xtpoisson** — Fixed-effects, random-effects, and population-averaged Poisson models

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