xtpoisson postestimation — Postestimation tools for xtpoisson

Postestimation commands   predict   margins   Remarks and examples
Methods and formulas   Also see

Postestimation commands

The following postestimation commands are available after `xtpoisson`:

Command	Description
`contrast`	contrasts and ANOVA-style joint tests of estimates
* `estat ic`	Akaike's, consistent Akaike's, corrected Akaike's, and Schwarz's Bayesian information criteria (AIC, CAIC, AICc, and BIC)
`estat summarize`	summary statistics for the estimation sample
`estat vce`	variance–covariance matrix of the estimators (VCE)
`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`	linear predictions and their SEs, number of events, incidence rates, probabilities
`predictnl`	point estimates, standard errors, testing, and inference for generalized predictions
`pwcompare`	pairwise comparisons of estimates
`test`	Wald tests of simple and composite linear hypotheses
`testnl`	Wald tests of nonlinear hypotheses

* `estat ic` and `lrtest` are not appropriate after `xtpoisson, pa`.

† `forecast` is not appropriate with `mi` estimation results.

predict

Description for predict

`predict` creates a new variable containing predictions such as linear predictions, standard errors, numbers of events, incidence rates, probabilities, and the equation-level score.

Menu for predict

Statistics > Postestimation

Syntax for predict

Random-effects (RE) model

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

Fixed-effects (FE) model

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

Population-averaged (PA) model

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

RE_statistic	Description
Main	
`xb`	linear prediction; the default
`stdp`	standard error of the linear prediction
`n`	predicted number of events marginal with respect to the random effect; only allowed after `xtpoisson, re normal`
`nu0`	predicted number of events assuming the random effect is zero
`iru0`	predicted incidence rate assuming the random effect is zero
`pr0(`n`)`	probability $\Pr(y = n)$ assuming the random effect is zero
`pr0(`a`,`b`)`	probability $\Pr(a \leq y \leq b)$ assuming the random effect is zero

FE_statistic	Description
Main	
`xb`	linear prediction; the default
`stdp`	standard error of the linear prediction
`nu0`	predicted number of events assuming the fixed effect is zero
`iru0`	predicted incidence rate assuming the fixed effect is zero

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 $\Pr(y = n)$
pr(*a*,*b*)	probability $\Pr(a \leq y \leq b)$
stdp	standard error of the linear prediction
score	first derivative of the log likelihood with respect to $\mathbf{x}_{it}\boldsymbol{\beta}$

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` 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.

`n` calculates the predicted number of events marginally with respect to the random effect, which means that the statistic is calculated by integrating the prediction function with respect to the random effect over its entire support. This option is only allowed after `xtpoisson, re normal`.

`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 $\Pr(y = n)$ 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 $\Pr(a \leq y \leq b)$ 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 $\Pr(y \geq 20)$;
`pr0(20,`*b*`)` calculates $\Pr(y \geq 20)$ in observations for which $b \geq .$ and calculates $\Pr(20 \leq y \leq b)$ 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 $\Pr(y = n)$, 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 $\Pr(a \leq y \leq b)$ (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, $u_{it} = \partial \ln L(\mathbf{x}_{it}\boldsymbol{\beta})/\partial(\mathbf{x}_{it}\boldsymbol{\beta})$.

`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 $\mathbf{x}_{it}\boldsymbol{\beta} + \text{offset}_{it}$.

margins

Description for margins

margins estimates margins of response for linear predictions, numbers of events, incidence rates, and probabilities.

Menu for margins

Statistics > Postestimation

Syntax for margins

margins [*marginlist*] [, *options*]

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

Random-effects (RE) model

statistic	Description
xb	linear prediction; the default after xtpoisson, re
n	predicted number of events marginal with respect to the random effect; the default
nu0	predicted number of events assuming the random effect is zero
iru0	predicted incidence rate assuming the random effect is zero
pr0(*n*)	probability $\Pr(y = n)$ assuming the random effect is zero
pr0(*a*,*b*)	probability $\Pr(a \leq y \leq b)$ assuming the random effect is zero
stdp	not allowed with margins

Fixed-effects (FE) model

statistic	Description
xb	linear prediction; the default
nu0	predicted number of events assuming the fixed effect is zero
iru0	predicted incidence rate assuming the fixed effect is zero
stdp	not allowed with margins

Population-averaged (PA) model

statistic	Description
mu	predicted number of events; considers the offset(); the default
rate	predicted number of events
xb	linear prediction
pr(*n*)	probability $\Pr(y = n)$
pr(*a*,*b*)	probability $\Pr(a \leq y \leq b)$
stdp	not allowed with margins
score	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**.

Remarks and examples

stata.com

▷ Example 1: Predicted number of events and incidence rate with no random effect

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 https://www.stata-press.com/data/r18/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

The probabilities calculated using the `pr0(`n`)` option are the probability $\Pr(y_{it} = n)$ for a RE model assuming the random effect is zero. Define $\mu_{it} = \exp(\mathbf{x}_{it}\boldsymbol{\beta} + \text{offset}_{it})$. The probabilities in `pr0(`n`)` are calculated as the probability that $y_{it} = n$, where y_{it} has a Poisson distribution with mean μ_{it}. Specifically,

$$\Pr(y_{it} = n) = (n!)^{-1} \exp(-\mu_{it})(\mu_{it})^n$$

Probabilities calculated using the `pr(`*n*`)` option after fitting a PA model are also calculated as described above.

Also see

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

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

For suggested citations, see the FAQ on citing Stata documentation.