**Description**

`bayes: poisson` fits a Bayesian Poisson regression to a nonnegative count outcome; see [BAYES] `bayes` and [R] `poisson` for details.

**Quick start**

Bayesian Poisson regression of `y` on `x1` and `x2`, using default normal priors for regression coefficients

```stata
bayes: poisson y x1 x2
```

Use a standard deviation of 10 instead of 100 for the default normal priors

```stata
bayes, normalprior(10): poisson y x1 x2
```

Use uniform priors for the slopes and a normal prior for the intercept

```stata
bayes, prior({y: x1 x2}, uniform(-10,10)) ///
    prior({y:_cons}, normal(0,10)): poisson y x1 x2
```

Save simulation results to `simdata.dta`, and use a random-number seed for reproducibility

```stata
bayes, saving(simdata) rseed(123): poisson y x1 x2
```

Specify 20,000 MCMC samples, set length of the burn-in period to 5,000, and request that a dot be displayed every 500 simulations

```stata
bayes, mcmcsize(20000) burnin(5000) dots(500): poisson y x1 x2
```

In the above, request that the 90% HPD credible interval be displayed instead of the default 95% equal-tailed credible interval

```stata
bayes, clevel(90) hpd
```

Display incidence-rate ratios instead of coefficients

```stata
bayes: poisson y x1 x2, irr
```

Display incidence-rate ratios on replay

```stata
bayes, irr
```

Also see **Quick start** in [BAYES] `bayes` and **Quick start** in [R] `poisson`.

**Menu**

Statistics  >  Count outcomes  >  Bayesian regression  >  Poisson regression
### Syntax

```bash
bayes [, bayesopts] : poisson depvar [ indepvars ] [ if ] [ in ] [ weight ] [, options ]
```

<table>
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<th>options</th>
<th>Description</th>
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<td>Model</td>
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<td>noconstant</td>
<td>suppress constant term</td>
</tr>
<tr>
<td>exposure(varname_e)</td>
<td>include ln(varname_e) in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>offset(varname_o)</td>
<td>include varname_o in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>Reporting</td>
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<tr>
<td>irr</td>
<td>report incidence-rate ratios</td>
</tr>
<tr>
<td>display_options</td>
<td>control spacing, line width, and base and empty cells</td>
</tr>
<tr>
<td>level(#)</td>
<td>set credible level; default is level(95)</td>
</tr>
</tbody>
</table>

indepvars may contain factor variables; see [U] 11.4.3 Factor variables.
depvar, indepvars, varname_e, and varname_o may contain time-series operators; see [U] 11.4.4 Time-series varlists.
fweights are allowed; see [U] 11.1.6 weight.
bayes: poisson, level() is equivalent to bayes, clevel(): poisson.
For a detailed description of options, see Options in [R] poisson.

### Bayesopts

<table>
<thead>
<tr>
<th>Priors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>*normalprior(#)</td>
<td>specify standard deviation of default normal priors for regression coefficients; default is normalprior(100)</td>
</tr>
<tr>
<td>prior(priorspec)</td>
<td>prior for model parameters; this option may be repeated</td>
</tr>
<tr>
<td>dryrun</td>
<td>show model summary without estimation</td>
</tr>
<tr>
<td>Simulation</td>
<td></td>
</tr>
<tr>
<td>nchains(#)</td>
<td>number of chains; default is to simulate one chain</td>
</tr>
<tr>
<td>mcmcsize(#)</td>
<td>MCMC sample size; default is mcmcsize(10000)</td>
</tr>
<tr>
<td>burnin(#)</td>
<td>burn-in period; default is burnin(2500)</td>
</tr>
<tr>
<td>thinning(#)</td>
<td>thinning interval; default is thinning(1)</td>
</tr>
<tr>
<td>rseed(#)</td>
<td>random-number seed</td>
</tr>
<tr>
<td>exclude(paramref)</td>
<td>specify model parameters to be excluded from the simulation results</td>
</tr>
<tr>
<td>Blocking</td>
<td></td>
</tr>
<tr>
<td>*blocksize(#)</td>
<td>maximum block size; default is blocksize(50)</td>
</tr>
<tr>
<td>block(paramref[, blockopts])</td>
<td>specify a block of model parameters; this option may be repeated</td>
</tr>
<tr>
<td>blocksummary</td>
<td>display block summary</td>
</tr>
<tr>
<td>*noblocking</td>
<td>do not block parameters by default</td>
</tr>
</tbody>
</table>
### Initialization

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>initial(initspec)</code></td>
<td>specify initial values for model parameters with a single chain</td>
</tr>
<tr>
<td><code>init#(initspec)</code></td>
<td>specify initial values for #th chain; requires <code>nchains()</code></td>
</tr>
<tr>
<td><code>initall(initspec)</code></td>
<td>specify initial values for all chains; requires <code>nchains()</code></td>
</tr>
<tr>
<td><code>nomleinitial</code></td>
<td>suppress the use of maximum likelihood estimates as starting values</td>
</tr>
<tr>
<td><code>initrandom</code></td>
<td>specify random initial values</td>
</tr>
<tr>
<td><code>initsummary</code></td>
<td>display initial values used for simulation</td>
</tr>
<tr>
<td><code>*noisy</code></td>
<td>display output from the estimation command during initialization</td>
</tr>
</tbody>
</table>

### Adaptation

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>adaptation(adaptopts)</code></td>
<td>control the adaptive MCMC procedure</td>
</tr>
<tr>
<td><code>scale(#)</code></td>
<td>initial multiplier for scale factor; default is <code>scale(2.38)</code></td>
</tr>
<tr>
<td><code>covariance(cov)</code></td>
<td>initial proposal covariance; default is the identity matrix</td>
</tr>
</tbody>
</table>

### Reporting

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>clevel(#)</code></td>
<td>set credible interval level; default is <code>clevel(95)</code></td>
</tr>
<tr>
<td><code>hpd</code></td>
<td>display HPD credible intervals instead of the default equal-tailed credible intervals</td>
</tr>
<tr>
<td><code>*irr</code></td>
<td>report incidence-rate ratios</td>
</tr>
<tr>
<td><code>eform[(string)]</code></td>
<td>report exponentiated coefficients and, optionally, label as <code>string</code></td>
</tr>
<tr>
<td><code>batch(#)</code></td>
<td>specify length of block for batch-means calculations; default is <code>batch(0)</code></td>
</tr>
<tr>
<td><code>saving(filename[, replace])</code></td>
<td>save simulation results to <code>filename.dta</code></td>
</tr>
<tr>
<td><code>nomodelsummary</code></td>
<td>suppress model summary</td>
</tr>
<tr>
<td><code>chainedetail</code></td>
<td>display detailed simulation summary for each chain</td>
</tr>
<tr>
<td><code>[no]dots</code></td>
<td>suppress dots or display dots every 100 iterations and iteration numbers every 1,000 iterations; default is <code>nodots</code></td>
</tr>
<tr>
<td><code>[no]show(paramref)</code></td>
<td>specify model parameters to be excluded from or included in the output</td>
</tr>
<tr>
<td><code>notable</code></td>
<td>suppress estimation table</td>
</tr>
<tr>
<td><code>noheader</code></td>
<td>suppress output header</td>
</tr>
<tr>
<td><code>title(string)</code></td>
<td>display <code>string</code> as title above the table of parameter estimates</td>
</tr>
<tr>
<td><code>display_options</code></td>
<td>control spacing, line width, and base and empty cells</td>
</tr>
</tbody>
</table>

### Advanced

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>search(search_options)</code></td>
<td>control the search for feasible initial values</td>
</tr>
<tr>
<td><code>corrlag(#)</code></td>
<td>specify maximum autocorrelation lag; default varies</td>
</tr>
<tr>
<td><code>corrtol(#)</code></td>
<td>specify autocorrelation tolerance; default is <code>corrtol(0.01)</code></td>
</tr>
</tbody>
</table>

*Starred options are specific to the `bayes` prefix; other options are common between `bayes` and `bayesmh`.

Options `prior()` and `block()` may be repeated.

`priorspec` and `paramref` are defined in [BAYES] `bayesmh`.

`paramref` may contain factor variables; see [U] 11.4.3 Factor variables.

See [U] 20 Estimation and postestimation commands for more capabilities of estimation commands.

Model parameters are regression coefficients `{depvar:indepvars}`. Use the `dryrun` option to see the definitions of model parameters prior to estimation.

For a detailed description of `bayesopts`, see Options in [BAYES] `bayes`.
Remarks and examples

For a general introduction to Bayesian analysis, see [BAYES] Intro. For a general introduction to Bayesian estimation using an adaptive Metropolis–Hastings algorithm, see [BAYES] bayesmh. For remarks and examples specific to the bayes prefix, see [BAYES] bayes. For details about the estimation command, see [R] poisson.

For a simple example of the bayes prefix, see Introductory example in [BAYES] bayes.

Stored results

See Stored results in [BAYES] bayes.

Methods and formulas

See Methods and formulas in [BAYES] bayesmh.

Also see

[BAYES] bayes — Bayesian regression models using the bayes prefix
[BAYES] Intro — Introduction to Bayesian analysis
[BAYES] bayesmh — Bayesian Poisson regression
[BAYES] bayesmh — Bayesian regression models using an adaptive Metropolis–Hastings algorithm
[BAYES] Bayesian commands — Introduction to commands for Bayesian analysis
[BAYES] Bayesian estimation — Bayesian estimation commands
[BAYES] Bayesian postestimation — Postestimation tools for bayesmh and the bayes prefix
[BAYES] Glossary