bayes: binreg — Bayesian generalized linear models: Extensions to the binomial family

Description

bayes: binreg fits a Bayesian binomial regression to a binary outcome, assuming different link functions; see [BAYES] bayes and [R] binreg for details.

Quick start

Bayesian binomial regression of \( y \) on \( x_1 \) and \( x_2 \), using the default logit link and using default normal priors for regression coefficients

\[
\text{bayes: binreg } y \ x_1 \ x_2
\]

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

\[
\text{bayes, normalprior(10): binreg } y \ x_1 \ x_2
\]

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

\[
\text{bayes, prior({y: x_1 x_2}, uniform(-10,10)) /// }
\text{prior({y:_cons}, normal(0,10)): binreg } y \ x_1 \ x_2
\]

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

\[
\text{bayes, saving(simdata) rseed(123): binreg } y \ x_1 \ x_2
\]

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

\[
\text{bayes, mcmcsize(20000) burnin(5000) dots(500): binreg } y \ x_1 \ x_2
\]

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

\[
\text{bayes, clevel(90) hpd}
\]

Display odds ratios instead of coefficients

\[
\text{bayes: binreg } y \ x_1 \ x_2, \text{ or}
\]

Use the log link and report risk ratios

\[
\text{bayes: binreg } y \ x_1 \ x_2, \text{ rr}
\]

Display coefficients instead of risk ratios

\[
\text{bayes, coefficients}
\]

Also see Quick start in [BAYES] bayes and Quick start in [R] binreg.

Menu

Statistics > Generalized linear models > Bayesian GLM for the binomial family
## Syntax

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

<table>
<thead>
<tr>
<th>options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
</tr>
<tr>
<td><code>noconstant</code></td>
<td>suppress constant term</td>
</tr>
<tr>
<td>or <code>rr</code></td>
<td>use logit link and report odds ratios</td>
</tr>
<tr>
<td>or <code>rd</code></td>
<td>use identity link and report risk differences</td>
</tr>
<tr>
<td>n(#) <code>varname</code></td>
<td>use # or <code>varname</code> for number of trials</td>
</tr>
<tr>
<td>exposure(<code>varname</code>)</td>
<td>include ln(<code>varname</code>) in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>offset(<code>varname</code>)</td>
<td>include <code>varname</code> in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>mu(<code>varname</code>)</td>
<td>use <code>varname</code> as the initial estimate for the mean of depvar</td>
</tr>
<tr>
<td>init(<code>varname</code>)</td>
<td>synonym for mu(<code>varname</code>)</td>
</tr>
<tr>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>coefficients</td>
<td>report nonexponentiated coefficients</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` and `indepvars` may contain time-series operators; see [U] 11.4.4 Time-series varlists.
Weights are allowed; see [U] 11.1.6 weight.
`bayes: binreg, level()` is equivalent to `bayes, clevel(): binreg`.
For a detailed description of `options`, see Options in [R] binreg. binreg’s option `ml` is implied with `bayes: binreg`.

<table>
<thead>
<tr>
<th>bayesopts</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priors</td>
<td></td>
</tr>
<tr>
<td><code>normalprior(#)</code></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 show model summary without estimation</td>
</tr>
<tr>
<td>dryrun</td>
<td></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><code>blocksize(#)</code></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 display block summary</td>
</tr>
<tr>
<td><code>noblocking</code></td>
<td>do not block parameters by default</td>
</tr>
</tbody>
</table>
Initialization

initial(initspec) specify initial values for model parameters with a single chain
init#(initspec) specify initial values for #th chain; requires nchains()
initall(initspec) specify initial values for all chains; requires nchains()
nomleinitial suppress the use of maximum likelihood estimates as starting values
initrandom specify random initial values
initsummary display initial values used for simulation
*noisily display output from the estimation command during initialization

Adaptation

adaptation(adaptopts) control the adaptive MCMC procedure
scale(#) initial multiplier for scale factor; default is scale(2.38)
covariance(cov) initial proposal covariance; default is the identity matrix

Reporting

clevel(#) set credible interval level; default is clevel(95)
hpd display HPD credible intervals instead of the default equal-tailed credible intervals
coefficients report nonexponentiated coefficients
coefficients eform[string] report exponentiated coefficients and, optionally, label as string
batch(#) specify length of block for batch-means calculations; default is batch(0)
saving(filename[, replace]) save simulation results to filename.dta
nomodelsummary suppress model summary
chainsdetail display detailed simulation summary for each chain
[nodots] dots suppress dots or display dots every 100 iterations and iteration numbers every 1,000 iterations; default is nodots
dots[#[, every(#)]]) display dots as simulation is performed
[no]show(paramref) specify model parameters to be excluded from or included in the output

Advanced

search(search_options) control the search for feasible initial values
corrlag(#) specify maximum autocorrelation lag; default varies
corrtol(#) specify autocorrelation tolerance; default is corrtol(0.01)

*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] binreg.

For a simple example of the bayes prefix, see Introductory example in [BAYES] bayes. Also see Logistic regression with perfect predictors 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
[R] binreg — Generalized linear models: Extensions to the binomial family
[BAYES] Bayesian postestimation — Postestimation tools for bayesmh and the bayes prefix
[BAYES] Bayesian estimation — Bayesian estimation commands
[BAYES] Bayesian commands — Introduction to commands for Bayesian analysis
[BAYES] Intro — Introduction to Bayesian analysis
[BAYES] Glossary