Description

bayes: gnbreg fits a Bayesian generalized negative binomial regression to a nonnegative count outcome; see [BAYES] bayes and [R] nbreg for details.

Quick start

Bayesian generalized negative binomial regression of y on x1 and x2, using z to model the log-overdispersion and using default normal priors for regression coefficients and log-overdispersion parameter

\[
\text{bayes: gnbreg y x1 x2, lnalpha(z)}
\]

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

\[
\text{bayes, normalprior(10): gnbreg y x1 x2, lnalpha(z)}
\]

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

\[
\text{bayes, prior({y: x1 x2}, uniform(-10,10)) ///}
\text{prior({y:cons}, normal(0,10)): gnbreg y x1 x2, lnalpha(z)}
\]

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

\[
\text{bayes, saving(simdata) rseed(123): gnbreg y x1 x2, lnalpha(z)}
\]

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

\[
\text{bayes, mcmcsize(20000) burnin(5000) dots(500): gnbreg y x1 x2, lnalpha(z)}
\]

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 incidence-rate ratios instead of coefficients

\[
\text{bayes: gnbreg y x1 x2, lnalpha(z) irr}
\]

Display incidence-rate ratios on replay

\[
\text{bayes, irr}
\]

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

Menu

Statistics > Count outcomes > Bayesian regression > Generalized negative binomial regression
### Syntax

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

#### options

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

*indepsvars* and *varlist* may contain factor variables; see [U] 11.4.3 Factor variables. 

*weights* are allowed; see [U] 11.1.6 weight.

bayes: gnbreg, level() is equivalent to bayes, clevel(): gnbreg.

For a detailed description of *options*, see Options for gnbreg in [R] nbreg.

#### bayesopts

<table>
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<th>Description</th>
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<tr>
<td><strong>Priors</strong></td>
</tr>
<tr>
<td><em>normalprior(#)</em> specify standard deviation of default normal priors for regression coefficients and log-overdispersion parameter; default is normalprior(100)</td>
</tr>
<tr>
<td><em>prior(priorspec)</em> prior for model parameters; this option may be repeated</td>
</tr>
<tr>
<td><strong>Simulation</strong></td>
</tr>
<tr>
<td><em>nchains(#)</em> number of chains; default is to simulate one chain</td>
</tr>
<tr>
<td><em>mcmcsize(#)</em> MCMC sample size; default is mcmcsize(10000)</td>
</tr>
<tr>
<td><em>burnin(#)</em> burn-in period; default is burnin(2500)</td>
</tr>
<tr>
<td><em>thinning(#)</em> thinning interval; default is thinning(1)</td>
</tr>
<tr>
<td><em>rseed(#)</em> random-number seed</td>
</tr>
<tr>
<td><em>exclude(paramref)</em> specify model parameters to be excluded from the simulation results</td>
</tr>
<tr>
<td><strong>Blocking</strong></td>
</tr>
<tr>
<td><em>blocksize(#)</em> maximum block size; default is blocksize(50)</td>
</tr>
<tr>
<td><em>block(paramref[, blockopts])</em> specify a block of model parameters; this option may be repeated</td>
</tr>
<tr>
<td><em>blocksummary</em> display block summary</td>
</tr>
<tr>
<td><em>noblocking</em> do not block parameters by default</td>
</tr>
</tbody>
</table>
Initialization

\texttt{\textbf{initial}(initspec)}

specify initial values for model parameters with a single chain
\texttt{\textbf{init#}(initspec)}

specify initial values for \#th chain; requires \texttt{nchains()}
\texttt{\textbf{initall}(initspec)}

specify initial values for all chains; requires \texttt{nchains()}
\texttt{\textbf{nomleinitial}}

suppress the use of maximum likelihood estimates as starting values
\texttt{\textbf{initrandom}}

specify random initial values
\texttt{\textbf{initsummary}}

display initial values used for simulation
\texttt{\textbf{*noisily}}

display output from the estimation command during initialization

Adaptation

\texttt{\textbf{adaptation}(adaptopts)}

control the adaptive MCMC procedure
\texttt{\textbf{scale}(\#)}

initial multiplier for scale factor; default is \texttt{scale(2.38)}
\texttt{\textbf{covariance}(cov)}

initial proposal covariance; default is the identity matrix

Reporting

\texttt{\textbf{clevel}(\#)}

set credible interval level; default is \texttt{clevel(95)}
\texttt{\textbf{hpd}}

display HPD credible intervals instead of the default equal-tailed credible intervals
\texttt{\textbf{*irr}}

report incidence-rate ratios
\texttt{\textbf{eform}\{string\}\}}

report exponentiated coefficients and, optionally, label as \texttt{string}
\texttt{\textbf{batch}(\#)}

specify length of block for batch-means calculations; default is \texttt{batch(0)}
\texttt{\textbf{saving}(filename[, replace])}

save simulation results to \texttt{filename.dta}
\texttt{\textbf{nomodelsummary}}

suppress model summary
\texttt{\textbf{chainsdetail}}

display detailed simulation summary for each chain
\texttt{\textbf{[no]}\textbf{dots}}

suppress dots or display dots every 100 iterations and iteration numbers every 1,000 iterations; default is \texttt{nodots}
\texttt{\textbf{dots}(\#, every(\#))}}

display dots as simulation is performed
\texttt{\textbf{[no]}\textbf{show}(paramref}\})

specify model parameters to be excluded from or included in the output
\texttt{\textbf{notable}}

suppress estimation table
\texttt{\textbf{noheader}}

suppress output header
\texttt{\textbf{title}(string)}

display \texttt{string} as title above the table of parameter estimates
\texttt{\textbf{display_options}}

control spacing, line width, and base and empty cells

Advanced

\texttt{\textbf{search}(search_options)}

control the search for feasible initial values
\texttt{\textbf{corrlag}(\#)}

specify maximum autocorrelation lag; default varies
\texttt{\textbf{corrtol}(\#)}

specify autocorrelation tolerance; default is \texttt{corrtol(0.01)}

\texttt{\textbf{*}}\texttt{Starred options are specific to the \texttt{bayes} prefix; other options are common between \texttt{bayes} and \texttt{bayesmh}.}

Options \texttt{prior()} and \texttt{block()} may be repeated.

\texttt{\textbf{priorspec}} and \texttt{paramref} are defined in \texttt{[BAYES] bayesmh}.

\texttt{paramref} may contain factor variables; see \texttt{[U] 11.4.3 Factor variables}.

See \texttt{[U] 20 Estimation and postestimation commands} for more capabilities of estimation commands.

Model parameters are regression coefficients \{\texttt{depvar}:\texttt{indepvars}\} for the main regression and \{\texttt{lnalpha}:\texttt{varlist}\} for the log-dispersion equation. Use the \texttt{dryrun} option to see the definitions of model parameters prior to estimation.

For a detailed description of \texttt{bayesopts}, see \texttt{Options} in \texttt{[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] nbreg.

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
[R] nbreg — Negative binomial regression
[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