**bayes: metobit — Bayesian multilevel tobit regression**

### Description

bayes: metobit fits a Bayesian multilevel tobit regression to a censored continuous outcome; see [BAYES] bayes and [ME] metobit for details.

### Quick start

Bayesian two-level tobit regression of \( y \) on \( x_1 \) and \( x_2 \) with random intercepts by \( id \), using a lower censoring limit of 17, and using default normal priors for regression coefficients and default inverse-gamma priors for the error variance and for the variance of random intercepts

```
bayes: metobit y x1 x2 || id:, ll(17)
```

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

```
bayes, normalprior(10): metobit y x1 x2 || id:, ll(17)
```

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

```
bayes, prior({y: x1 x2}, uniform(-10,10)) ///
prior({y: _cons}, normal(0,10)): metobit y x1 x2 || id:, ll(17)
```

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

```
bayes, saving(simdata) rseed(123): ///
metobit y x1 x2 || id:, ll(17)
```

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

```
bayes, mcmcsize(20000) burnin(5000) dots(500): ///
metobit y x1 x2 || id:, ll(17)
```

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

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

Also see *Quick start* in [BAYES] bayes and *Quick start* in [ME] metobit.

### Menu

Statistics > Multilevel mixed-effects models > Bayesian regression > Tobit regression
Syntax

```
bayes [, bayesopts] : metobit depvar fe_equation
                  [ || re_equation] [ || re_equation ...] [, options]
```

where the syntax of `fe_equation` is

```
[ indepvars] [ if] [ in] [ weight] [, fe_options]
```

and the syntax of `re_equation` is one of the following:

for random coefficients and intercepts

```
levelvar: [ varlist] [, re_options]
```

for random effects among the values of a factor variable

```
levelvar: R.varname
```

`levelvar` either is a variable identifying the group structure for the random effects at that level or is `all`, representing one group comprising all observations.

---

### `fe_options`

<table>
<thead>
<tr>
<th>Description</th>
<th><code>noconstant</code></th>
<th>suppress constant term from the fixed-effects equation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>offset(varname)</code></td>
<td>include <code>varname</code> in model with coefficient constrained to 1</td>
</tr>
</tbody>
</table>

---

### `re_options`

<table>
<thead>
<tr>
<th>Description</th>
<th><code>covariance(vartype)</code></th>
<th>variance–covariance structure of the random effects; only structures <code>independent</code>, <code>identity</code>, and <code>unstructured</code> supported</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>noconstant</code></td>
<td>suppress constant term from the random-effects equation</td>
</tr>
</tbody>
</table>

---

### `options`

| Description | `ll(varname | #)` | left-censoring variable or limit |
|-------------|----------------|---------------------------------|
|             | `ul(varname | #)` | right-censoring variable or limit |

**Reporting**

<table>
<thead>
<tr>
<th>Description</th>
<th><code>notable</code></th>
<th>suppress coefficient table</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>noheader</code></td>
<td>suppress output header</td>
</tr>
<tr>
<td></td>
<td><code>nogroup</code></td>
<td>suppress table summarizing groups</td>
</tr>
<tr>
<td></td>
<td><code>display_options</code></td>
<td>control spacing, line width, and base and empty cells</td>
</tr>
<tr>
<td></td>
<td><code>level(#)</code></td>
<td>set credible level; default is <code>level(95)</code></td>
</tr>
</tbody>
</table>
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Independent variables (indepvars) may contain factor variables; see [U] 11.4.3 Factor variables.
Dependent variable (depvar), independent variables (indepvars), and varlist may contain time-series operators; see [U] 11.4.4 Time-series varlists.
Fweights are allowed; see [U] 11.1.6 weight.
Bayes: metobit, level() is equivalent to bayes, clevel(): metobit.

For a detailed description of options, see Options in [ME] metobit.

### bayesopts

<table>
<thead>
<tr>
<th>Description</th>
<th>Priors</th>
<th>Simulation</th>
<th>Blocking</th>
<th>Initialization</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify standard deviation of default normal priors for regression coefficients; default is normalprior(100)</td>
<td><strong>normalprior(#)</strong></td>
<td><strong>nchains(#)</strong></td>
<td>blocksize(#)</td>
<td>initial(initspec)</td>
<td>scale(#)</td>
</tr>
<tr>
<td>Specify shape and scale of default inverse-gamma prior for variance components; default is igammaprior(0.01 0.01)</td>
<td><strong>igammaprior(# #)</strong></td>
<td><strong>mcmcsize(#)</strong></td>
<td>block(paramef[ , blockopts] )</td>
<td>init(#(initspec)</td>
<td>covariance(cov)</td>
</tr>
<tr>
<td>Specify degrees of freedom and, optionally, scale matrix of default inverse-Wishart prior for unstructured random-effects covariance prior for model parameters; this option may be repeated</td>
<td><strong>iwishartprior(# [ ...])</strong></td>
<td><strong>burnin(#)</strong></td>
<td>blocksummary</td>
<td>initall(initspec)</td>
<td></td>
</tr>
<tr>
<td>Show model summary without estimation</td>
<td><strong>prior(priorspec)</strong></td>
<td><strong>thinning(#)</strong></td>
<td><strong>noblock</strong></td>
<td>nomleinitial</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>dryrun</strong></td>
<td><strong>rseed(#)</strong></td>
<td>do not block parameters by default</td>
<td>initrand</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>exclude(paramref)</strong></td>
<td>specify stubs for random-effects parameters for all levels</td>
<td>initsumm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>restubs(restub1 restub2 ...)</strong></td>
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</table>

### Notes
- This is an excerpt from the Stata documentation for the `bayes: metobit` command. It provides details on the syntax, options, and usage of the command for Bayesian multilevel tobit regression.
- The table lists various options available in the `bayes: metobit` command, including Priors, Simulation, Blocking, Initialization, and Adaptation.
- Each option is described along with its default value or the behavior it represents.
- For a comprehensive understanding, refer to the Stata documentation for the `bayes: metobit` command.
bayes: metobit — Bayesian multilevel tobit regression

Reporting

clevel(#) set credible interval level; default is clevel(95)
hpd display HPD credible intervals instead of the default equal-tailed credible intervals

eform[(string)] report exponentiated coefficients and, optionally, label as string
remargl compute log marginal-likelihood
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
nomesummary suppress multilevel-structure summary
chainsdetail display detailed simulation summary for each chain
[ no] dots suppress dots or display dots every 100 iterations and iteration numbers every 1,000 iterations; default is dots
dots(#[, every(#)]) display dots as simulation is performed
[ no] show(paramref) specify model parameters to be excluded from or included in the output
showeffects[(reref)] specify that all or a subset of random-effects parameters be included in the output
melabel display estimation table using the same row labels as metobit
nogroup suppress table summarizing groups
notable suppress estimation table
noheader suppress output header
title(string) display string as title above the table of parameter estimates
display_options control spacing, line width, and base and empty cells

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.

prior spec and param ref are defined in [BAYES] bayesmh.

param ref 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}, error variance {e. depvar:sigma2}, random effects {rename}, and either variance components {rename:sigma2} or, if option covariance(unstructured) is specified, matrix parameter {restub:Sigma,matrix}; see Likelihood model in [BAYES] bayes for how renames and restub are defined. 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 [ME] metobit.
For a simple example of the `bayes` prefix, see *Introductory example* in [BAYES] bayes. For multilevel examples, see *Multilevel models* 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
- [ME] metobit — Multilevel mixed-effects tobit 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