**Description**

`bayes: meoprobit` fits a Bayesian multilevel ordered probit regression to an ordinal outcome; see `[BAYES] bayes` and `[ME] meoprobit` for details.

**Quick start**

Bayesian two-level ordered probit regression of `y` on `x1` and `x2` with random intercepts by `id`, using default normal priors for regression coefficients, flat priors for cutpoints, and default inverse-gamma prior for the variance of random intercepts:

```
bayes: meoprobit y x1 x2 || id:
```

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

```
bayes, normalprior(10): meoprobit y x1 x2 || id:
```

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)): meoprobit y x1 x2 || id:
```

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

```
bayes, saving(simdata) rseed(123): meoprobit y x1 x2 || id:
```

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): meoprobit y x1 x2 || id:
```

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] meoprobit*.

**Menu**

Statistics > Multilevel mixed-effects models > Bayesian regression > Ordered probit regression
Syntax

\[\texttt{bayes\ [\ ,\ bayesopts\ ]:\ meoprobit\ depvar\ fe\_equation}\]
\[\ [\ ||\ re\_equation\ ]\ [\ ||\ re\_equation\ \ldots\ ]\ [\ ,\ options]\]

where the syntax of \textit{fe\_equation} is

\[\ [\ \textit{indepvars}\ ]\ [\ \textit{if}\ ]\ [\ \textit{in}\ ]\ [\ \textit{weight}\ ]\ [\ ,\ \textit{fe\_options}\ ]\]

and the syntax of \textit{re\_equation} is one of the following:

for random coefficients and intercepts

\[\textit{levelvar}:\ [\ \textit{varlist}\ ]\ [\ ,\ \textit{re\_options}\ ]\]

for random effects among the values of a factor variable

\[\textit{levelvar}:\ \texttt{R.\varname}\]

\textit{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.

\textit{fe\_options} Description

<table>
<thead>
<tr>
<th>Model</th>
<th>\texttt{offset(varname)}</th>
<th>include \textit{varname} in model with coefficient constrained to 1</th>
</tr>
</thead>
</table>

\textit{re\_options} Description

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

<table>
<thead>
<tr>
<th>options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>\texttt{notable}</td>
<td>suppress coefficient table</td>
</tr>
<tr>
<td>\texttt{noheader}</td>
<td>suppress output header</td>
</tr>
<tr>
<td>\texttt{nogroup}</td>
<td>suppress table summarizing groups</td>
</tr>
<tr>
<td>\texttt{display_options}</td>
<td>control spacing, line width, and base and empty cells</td>
</tr>
<tr>
<td>\texttt{level(#)}</td>
<td>set credible level; default is \texttt{level(95)}</td>
</tr>
</tbody>
</table>

\textit{indepvars} may contain factor variables; see \texttt{[U] 11.4.3 Factor variables}.
\textit{depvar, indepvars, and varlist may contain time-series operators; see [U] 11.4.4 Time-series varlists}.
\textit{fweights are allowed; see [U] 11.1.6 weight}.
\texttt{bayes: meoprobit, level()} is equivalent to \texttt{bayes, clevel(): meoprobit}.
For a detailed description of \textit{options}, see \textit{Options} in [ME] \texttt{meoprobit}.
bayesopts

### Description

**Priors**

- **normalprior(#)***
  - Specify standard deviation of default normal priors for regression coefficients; default is `normalprior(100)`

- **igammaprior(# #)**
  - Specify shape and scale of default inverse-gamma prior for variance components; default is `igammaprior(0.01 0.01)`

- **iwishartprior(# [...])**
  - 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

- **prior(priorspec)**
  - Prior for model parameters; this option may be repeated

- **dryrun**
  - Show model summary without estimation

**Simulation**

- **nchains(#)***
  - Number of chains; default is to simulate one chain

- **mcmcsize(#)***
  - MCMC sample size; default is `mcmcsize(10000)`

- **thinning(#)***
  - Thinning interval; default is `thinning(1)`

- **rseed(#)***
  - Random-number seed

- **exclude(paramref)**
  - Specify model parameters to be excluded from the simulation results

- **restubs(restub1 restub2 ...)**
  - Specify stubs for random-effects parameters for all levels

**Blocking**

- **blocksize(#)***
  - Maximum block size; default is `blocksize(50)`

- **block(paramref[ , blockopts])**
  - Specify a block of model parameters; this option may be repeated

- **noblocking**
  - Do not block parameters by default

**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()`

- **nomleinit**
  - 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
bayes: meoprobit — Bayesian multilevel ordered probit 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 meoprobit 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.

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}, cutpoints {cut1}, {cut2}, and so on, 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.

Flat priors, flat, are used by default for cutpoints.

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] meoprobit.
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] meoprobit — Multilevel mixed-effects ordered probit 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