

[Description](#)[Remarks and examples](#)[Quick start](#)[Stored results](#)[Menu](#)[Methods and formulas](#)[Syntax](#)[Also see](#)

Description

`bayes: xtreg` fits a Bayesian panel-data random-effects linear regression to a continuous outcome; see [\[BAYES\] bayes](#) and [\[XT\] xtreg](#) for details.

Quick start

Bayesian random-effects linear regression of y on x_1 and x_2 with random intercepts by `id` (after `xtset`ing on panel variable `id`), using default normal priors for regression coefficients and default inverse-gamma priors for the error variance and for the variance of random intercepts

```
bayes: xtreg y x1 x2
```

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

```
bayes, normalprior(10): xtreg y x1 x2
```

Use a shape of 1 and a scale of 2 instead of values of 0.01 for the default inverse-gamma prior

```
bayes, igammaprior(1 2): xtreg y x1 x2
```

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)): xtreg y x1 x2
```

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

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

Specify 20,000 Markov chain Monte Carlo (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): xtreg y x1 x2
```

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

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

Use Gibbs sampling for all parameters, including random effects

```
bayes, gibbs: xtreg y x1 x2
```

Also see [Quick start](#) in [\[BAYES\] bayes](#) and [Quick start](#) in [\[XT\] xtreg](#).

Menu

Statistics > Longitudinal/panel data > Bayesian regression > Linear regression

Syntax

bayes [, bayesopts] : xtreg *depvar* [*indepvars*] [*if*] [*in*] [, options]

| <i>options</i> | Description |
|----------------|-------------|
|----------------|-------------|

Model

| | |
|-------------------|------------------------|
| <u>noconstant</u> | suppress constant term |
|-------------------|------------------------|

Reporting

| | |
|------------------------|---|
| <u>display_options</u> | control spacing, line width, and base and empty cells |
|------------------------|---|

| | |
|------------------|--|
| <u>level</u> (#) | set credible level; default is level(95) |
|------------------|--|

A panel variable must be specified; see [XT] [xtset](#).

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](#).

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

For a detailed description of options, see [Options](#) in [XT] [xtreg](#).

| <i>bayesopts</i> | Description |
|------------------|-------------|
|------------------|-------------|

Priors

| | |
|-----------------------------------|---|
| * <u>gibbs</u> | specify Gibbs sampling; available only with normal priors for regression coefficients and an inverse-gamma prior for variance |
| * <u>normalprior</u> (#) | specify standard deviation of default normal priors for regression coefficients; default is normalprior(100) |
| * <u>igammaprior</u> (# #) | specify shape and scale of default inverse-gamma prior for variance components; default is igammaprior(0.01 0.01) |
| <u>prior</u> (<i>priorspec</i>) | prior for model parameters; this option may be repeated |
| <u>dryrun</u> | show model summary without estimation |

Simulation

| | |
|------------------------------------|---|
| <u>nchains</u> (#) | number of chains; default is to simulate one chain |
| <u>mcmcsize</u> (#) | MCMC sample size; default is mcmcsize(10000) |
| <u>burnin</u> (#) | burn-in period; default is burnin(2500) |
| <u>thinning</u> (#) | thinning interval; default is thinning(1) |
| <u>rseed</u> (#) | random-number seed |
| <u>exclude</u> (<i>paramref</i>) | specify model parameters to be excluded from the simulation results |

Blocking

| | |
|--|--|
| <u>block</u> (<i>paramref</i> [, <i>blockopts</i>]) | specify a block of model parameters; this option may be repeated |
| <u>blocksummary</u> | display block summary |

Initialization

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

Adaptation

| | |
|---|--|
| <code>adaptation(<i>adaptopts</i>)</code> | control the adaptive MCMC procedure |
| <code>scale(#)</code> | initial multiplier for scale factor; default is <code>scale(2.38)</code> |
| <code>covariance(<i>cov</i>)</code> | initial proposal covariance; default is the identity matrix |

Reporting

| | |
|--|---|
| <code>clevel(#)</code> | set credible interval level; default is <code>clevel(95)</code> |
| <code>hpd</code> | display HPD credible intervals instead of the default equal-tailed credible intervals |
| <code>eform[(<i>string</i>)]</code> | report exponentiated coefficients and, optionally, label as <i>string</i> |
| <code>remargl</code> | compute log marginal-likelihood; suppressed by default |
| <code>batch(#)</code> | specify length of block for batch-means calculations; default is <code>batch(0)</code> |
| <code>saving(<i>filename</i>[, <i>replace</i>])</code> | save simulation results to <i>filename.dta</i> |
| <code>nomodelsummary</code> | suppress model summary |
| <code>chainsdetail</code> | display detailed simulation summary for each chain |
| <code>[no]dots</code> | suppress dots or display dots every 100 iterations and iteration numbers every 1,000 iterations; default is <code>nodots</code> |
| <code>dots(#[, <i>every</i>(#)])</code> | display dots as simulation is performed |
| <code>[no]show(<i>paramref</i>)</code> | specify model parameters to be excluded from or included in the output |
| <code>showeffects[(<i>reref</i>)]</code> | specify that all or a subset of random-effects parameters be included in the output |
| <code>notable</code> | suppress estimation table |
| <code>noheader</code> | suppress output header |
| <code>title(<i>string</i>)</code> | display <i>string</i> as title above the table of parameter estimates |
| <code>display_options</code> | control spacing, line width, and base and empty cells |

Advanced

| | |
|--|--|
| <code>search(<i>search_options</i>)</code> | control the search for feasible initial values |
| <code>corrlag(#)</code> | specify maximum autocorrelation lag; default varies |
| <code>corrtol(#)</code> | specify autocorrelation tolerance; default is <code>corrtol(0.01)</code> |

* 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**.

`collect` is allowed; see [U] 11.1.10 **Prefix commands**.

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

Model parameters are regression coefficients `{deivar: indepvars}`, error variance `{sigma2}`, random effects `{U[panelvar]}` or simply `{U}`, and random-effects variance `{var_U}`. 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 adaptive Metropolis–Hastings and Gibbs algorithms, see [BAYES] `bayesmh`. For remarks and examples specific to the `bayes` prefix, see [BAYES] `bayes`. For details about the estimation command, see [XT] `xtreg`.

For a simple example of the bayes prefix, see *Introductory example* in [BAYES] [bayes](#). Also see *Panel-data models* in [BAYES] [bayes](#).

Stored results

See *Stored results* in [BAYES] [bayes](#). In addition, bayes: xtreg also stores the following results:

Macros

| | |
|--------------|--------------------------------|
| e(ivar) | variable denoting groups |
| e(redistrib) | distribution of random effects |

Methods and formulas

See *Methods and formulas* in [BAYES] [bayesmh](#).

Also see

[BAYES] [bayes](#) — Bayesian regression models using the bayes prefix

[XT] [xtreg](#) — Linear models for panel data⁺

[BAYES] [Bayesian postestimation](#) — Postestimation tools after Bayesian estimation

[BAYES] [Bayesian estimation](#) — Bayesian estimation commands

[BAYES] [Bayesian commands](#) — Introduction to commands for Bayesian analysis

[BAYES] [Intro](#) — Introduction to Bayesian analysis

[BAYES] [Glossary](#)

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