

**bayes: xtreg** — Bayesian random-effects linear model
[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 `x1` and `x2` 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, mcmcsample(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
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### Model

<code>noconstant</code>	suppress constant term
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### Reporting

<code>display_options</code>	control spacing, line width, and base and empty cells
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<code>level(#)</code>	set credible level; default is level(95)
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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
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### Priors

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

### Simulation

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

### Blocking

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

### Initialization

<code>initial(initspec)</code>	specify initial values for model parameters with a single chain
<code>init#(initspec)</code>	specify initial values for #th chain; requires <code>nchains()</code>
<code>initall(initspec)</code>	specify initial values for all chains; requires <code>nchains()</code>
<code>nonleinitial</code>	suppress the use of maximum likelihood estimates as starting values
<code>initransom</code>	specify random initial values
<code>initsummary</code>	display initial values used for simulation
* <code>noisily</code>	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  
`eform`[ (*string*) ] report exponentiated coefficients and, optionally, label as *string*  
`remargl` compute log marginal-likelihood; suppressed by default  
`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  
`[no]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  
`showreflects`[ (*refef*) ] specify that all or a subset of random-effects parameters be included in the output  
`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)`

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\*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 {*depvar*:*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

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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<sup>+</sup>

[XT] **xtreg** — Linear models for panel data<sup>+</sup>

[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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