

## 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 [xtsetting](#) 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
<b>Model</b>	
<u>noconstant</u>	suppress constant term
<b>Reporting</b>	
<i>display_options</i>	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
<b>Priors</b>	
*gibbs	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)
prior( <i>priorspec</i> )	prior for model parameters; this option may be repeated
dryrun	show model summary without estimation
<b>Simulation</b>	
nchains(#)	number of chains; default is to simulate one chain
mcmcsize(#)	MCMC sample size; default is mcmcsize(10000)
burnin(#)	burn-in period; default is burnin(2500)
thinning(#)	thinning interval; default is thinning(1)
rseed(#)	random-number seed
<u>exclude</u> ( <i>paramref</i> )	specify model parameters to be excluded from the simulation results
<b>Blocking</b>	
block( <i>paramref</i> [ , <i>blockopts</i> ])	specify a block of model parameters; this option may be repeated
<u>blocksummary</u>	display block summary
<b>Initialization</b>	
<u>initial</u> ( <i>initspec</i> )	specify initial values for model parameters with a single chain
init#( <i>initspec</i> )	specify initial values for #th chain; requires nchains()
initall( <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(adaptopts)</code>	control the adaptive MCMC procedure
<code>scale(#)</code>	initial multiplier for scale factor; default is <code>scale(2.38)</code>
<code>covariance(cov)</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(string)</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(filename[, replace])</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([#, every(#)])</code>	display dots as simulation is performed
<code>[no]show(paramref)</code>	specify model parameters to be excluded from or included in the output
<code>showeffects(reref)</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(string)</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(search_options)</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 `bayer` prefix; other options are common between `bayer` and `bayermh`.

Options `prior()` and `block()` may be repeated.

`priorspec` and `paramref` are defined in [BAYES] `bayermh`.

`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 `bayeropts`, see *Options* in [BAYES] `bayer`.

## 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] `bayermh`. For remarks and examples specific to the `bayer` prefix, see [BAYES] `bayer`. 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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