**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, 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

\[ \text{bayes [ , bayesopts ] : xtreg depvar [ indepvars ] [ if ] [ in ] [ , options ]} \]

\[ \text{options} \]

**Model**

- `noconstant` suppress constant term

**Reporting**

- `display_options` control spacing, line width, and base and empty cells
- `level(#)` 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.

**bayesopts**

**Priors**

- `gibbs` specify Gibbs sampling; available only with normal priors for regression coefficients and an inverse-gamma prior for variance
- `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)`

**Simulation**

- `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
- `exclude(paramref)` specify model parameters to be excluded from the simulation results

**Blocking**

- `block(paramref[ , blockopts ] )` specify a block of model parameters; this option may be repeated
- `blocksummary` display block summary

**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()`
- `nomleinitial` 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

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
showeffects[(reref)]  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)

* 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

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 — Fixed-, between-, and random-effects and population-averaged linear models
- [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