

bayes: xtprobit — Bayesian random-effects probit model
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Description

`bayes: xtprobit` fits a Bayesian panel-data random-effects probit model to a binary outcome; see [\[BAYES\] bayes](#) and [\[XT\] xtprobit](#) for details.

Quick start

Bayesian random-effects probit model 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 prior for the variance of random intercepts

```
bayes: xtprobit y x1 x2
```

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

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

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

```
bayes, saving(simdata) rseed(123): xtprobit 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): xtprobit 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
```

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

Menu

Statistics > Longitudinal/panel data > Binary outcomes > Bayesian regression > Probit regression

Syntax

```
bayes [ , bayesopts ] : xtprobit depvar [indepvars] [if] [in] [ , options ]
```

<i>options</i>	Description
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Model	
<u>noconstant</u>	suppress constant term
<u>offset</u> (<i>varname</i>)	include <i>varname</i> in model with coefficient constrained to 1
<u>asis</u>	retain perfect predictor variables

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

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

<i>bayesopts</i>	Description
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Priors	
* <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>nonleinitial</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

`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`[(*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)`

*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*}, 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 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 [XT] `xtprobit`.

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: xtprobit` also stores the following results:

Macros	
<code>e(ivar)</code>	variable denoting groups
<code>e(redistrib)</code>	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] **xtprobit** — Random-effects and population-averaged probit 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**

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