

**bayes: streg** — Bayesian parametric survival models
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## Description

`bayes: streg` fits a Bayesian parametric survival model to a survival-time outcome; see [\[BAYES\] bayes](#) and [\[ST\] streg](#) for details.

## Quick start

Bayesian Weibull survival model of `stset` survival-time outcome on `x1` and `x2`, using default normal priors for regression coefficients and log-ancillary parameters

```
bayes: streg x1 x2, distribution(weibull)
```

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

```
bayes, normalprior(10): streg x1 x2, distribution(weibull)
```

Use uniform priors for the slopes and a normal prior for the intercept

```
bayes, prior({_t: x1 x2}, uniform(-10,10)) ///
prior({_t:_cons}, normal(0,10)): streg x1 x2, distribution(weibull)
```

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

```
bayes, saving(simdata) rseed(123): ///
streg x1 x2, distribution(weibull)
```

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): ///
streg x1 x2, distribution(weibull)
```

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 accelerated failure-time metric instead of proportional-hazards parameterization, and display time ratios instead of coefficients

```
bayes, tratio: streg x1 x2, distribution(weibull) time
```

Display time ratios on replay

```
bayes, tratio
```

Also see [Quick start](#) in [\[BAYES\] bayes](#) and [Quick start](#) in [\[ST\] streg](#).

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## Syntax

```
bayes [ , bayesopts ] : streg [varlist] [if] [in] [ , options ]
```

<i>options</i>	Description
<b>Model</b>	
<code>noconstant</code>	suppress constant term
<code>distribution(exponential)</code>	exponential survival distribution
<code>distribution(gompertz)</code>	Gompertz survival distribution
<code>distribution(loglogistic)</code>	loglogistic survival distribution
<code>distribution(llogistic)</code>	synonym for <code>distribution(loglogistic)</code>
<code>distribution(weibull)</code>	Weibull survival distribution
<code>distribution(lognormal)</code>	lognormal survival distribution
<code>distribution(lnormal)</code>	synonym for <code>distribution(lognormal)</code>
<code>distribution(ggamma)</code>	generalized gamma survival distribution
<code>frailty(gamma)</code>	gamma frailty distribution
<code>frailty(invgaussian)</code>	inverse-Gaussian distribution
<code>time</code>	use accelerated failure-time metric
<b>Model 2</b>	
<code>strata(<i>varname</i>)</code>	strata ID variable
<code>offset(<i>varname</i>)</code>	include <i>varname</i> in model with coefficient constrained to 1
<code>shared(<i>varname</i>)</code>	shared frailty ID variable
<code>ancillary(<i>varlist</i>)</code>	use <i>varlist</i> to model the first ancillary parameter
<code>anc2(<i>varlist</i>)</code>	use <i>varlist</i> to model the second ancillary parameter
<b>Reporting</b>	
<code>nohr</code>	do not report hazard ratios
<code>tratio</code>	report time ratios
<code>noshow</code>	do not show st setting information
<code>display_options</code>	control spacing, line width, and base and empty cells
<code>level(#)</code>	set credible level; default is level(95)

You must `stset` your data before using `bayes: streg`; see [ST] [stset](#).

*varlist* may contain factor variables; see [U] [11.4.3 Factor variables](#).

`bayes: streg, level()` is equivalent to `bayes, clevel(): streg`.

For a detailed description of *options*, see [Options](#) in [ST] [streg](#).

<i>bayesopts</i>	Description
<b>Priors</b>	
* <code>normalprior(#)</code>	specify standard deviation of default normal priors for regression coefficients and log-ancillary parameters; default is <code>normalprior(100)</code>
<code>prior(<i>priorspec</i>)</code>	prior for model parameters; this option may be repeated
<code>dryrun</code>	show model summary without estimation

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

\*`blocksize(#)` maximum block size; default is `blocksize(50)`  
`block(paramref[, blockopts])` specify a block of model parameters; this option may be repeated  
`blocksummary` display block summary  
\*`noblocking` do not block parameters by default

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  
\*`nohr` do not report hazard ratios  
\*`tratio` report time ratios; requires option `time` with `streg`  
`eform(string)` report exponentiated coefficients and, optionally, label as *string*  
`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  
`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

<code>search(<i>search_options</i>)</code>	control the search for feasible initial values
<code>corr<sub>lag</sub>(#)</code>	specify maximum autocorrelation lag; default varies
<code>corr<sub>tol</sub>(#)</code>	specify autocorrelation tolerance; default is <code>corr<sub>tol</sub>(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 `{depvar:indepvars}` and ancillary parameters as described in *Ancillary model parameters*. 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

[stata.com](http://www.stata.com)

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 [ST] `streg`.

For a simple example of the `bayes` prefix, see *Introductory example* in [BAYES] `bayes`. Also see *Parametric survival model* in [BAYES] `bayes`.

## Ancillary model parameters

In addition to regression coefficients `{_t:varlist}`, `bayes: streg` defines ancillary parameters that depend on the chosen survival model; see table 1 below. Positive ancillary parameters are transformed to be defined on the whole real line. All ancillary parameters are assigned default normal priors with zero mean and variance of 10,000.

Table 1. Ancillary model parameters defined by `bayes: streg`

Distribution	Ancillary parameters	Transformed model parameters
Exponential	None	None
Weibull	$p$	<code>{ln_p}</code>
Gompertz	$\gamma$	<code>{gamma}</code>
Lognormal	$\sigma$	<code>{lnsigma}</code>
Loglogistic	$\gamma$	<code>{lngamma}</code>
Generalized gamma	$\sigma, \kappa$	<code>{lnsigma}</code> , <code>{kappa}</code>

For frailty models, when option `frailty()` or option `shared()` is specified with `streg`, `bayes: streg` also defines the log-frailty parameter `{lntheta}`.

If option `ancillary(varlist)` is specified, regression coefficients `{ln_p:varlist}`, `{gamma:varlist}`, and so on are defined for all ancillary parameters except  $\kappa$ . If option `anc2(varlist)` is specified, then regression coefficients `{kappa:varlist}` are defined for  $\kappa$ .

If option `strata(varname)` is specified, additional stratum-specific coefficients of the form `{eqname:#.varname}` are defined for the main regression and ancillary parameters. For example, if `drug` contains three strata, then specifying option `strata(drug)` will result in additional main regression coefficients `{_t:2.drug}` and `{_t:3.drug}` and—say, for Weibull regression—in additional parameters `{ln_p:2.drug}` and `{ln_p:3.drug}`. In the model summary with default priors, you may see these parameters labeled as `{_t:i.drug}` and `{ln_p:i.drug}`, for short.

Use the `dryrun` option with the `bayes` prefix to see the definitions of model parameters prior to estimation.

## Stored results

See *Stored results* in [BAYES] [bayes](#).

## Methods and formulas

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

## Also see

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

[ST] [streg](#) — Parametric survival 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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