

**bayes: dsgenl** — Bayesian nonlinear dynamic stochastic general equilibrium models

[Description](#)[Remarks and examples](#)[Quick start](#)[Stored results](#)[Menu](#)[Methods and formulas](#)[Syntax](#)[Also see](#)

## Description

`bayes: dsgenl` fits a Bayesian nonlinear dynamic stochastic general equilibrium (DSGE) model to continuous multivariate time series; see [\[BAYES\] bayes](#) and [\[DSGE\] dsgenl](#) for details.

## Quick start

Nonlinear DSGE model in which observed variable  $y$  depends on unobserved state  $z$

```
bayes, prior({rho}, uniform(0,1)) prior({alpha}, beta(5,5)): ///
dsgenl (y = z^{alpha}) (ln(F.z) = {rho}*ln(z)),          ///
exostate(z) observed(y)
```

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

```
bayes, prior({rho}, uniform(0,1)) prior({alpha}, beta(5,5)): ///
rseed(17) saving(bdsgenlsim):                          ///
dsgenl (y = z^{alpha}) (ln(F.z) = {rho}*ln(z)),          ///
exostate(z) observed(y)
```

Specify 20,000 Markov chain Monte Carlo (MCMC) samples, and set length of burn-in period to 5,000

```
bayes, prior({rho}, uniform(0,1)) prior({alpha}, beta(5,5)): ///
mcmcsize(20000) burnin(5000):                          ///
dsgenl (y = z^{alpha}) (ln(F.z) = {rho}*ln(z)),          ///
exostate(z) observed(y)
```

Estimate parameters of a four-equation production model. Priors for  $\alpha$ ,  $\beta$ , and  $\rho$  are given by beta distributions with means 0.3, 0.9, and 0.5, respectively

```
bayes, prior({alpha}, beta(3,7))                        ///
prior({beta}, beta(9,1))                               ///
prior({rho}, beta(7,7)) :                              ///
dsgenl (1/c = {alpha}*{beta}*(1/F.c)*(F.y/F.k))        ///
(y = z*k^{alpha}) (F.k = y - c)                       ///
(ln(F.z) = {rho}*ln(z)) ,                             ///
exostate(z) endostate(k) observed(y) unobserved(c)
```

In the above, request that a 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](#).

## Menu

Statistics > Multivariate time series > Bayesian models > Nonlinear DSGE models

## Syntax

```
bayes, prior(userparams, ...) [bayesopts] : dsgenl (eqn_list) [if] [in] [, options]
```

<i>options</i>	Description
----------------	-------------

### Model

* <i>observed(string)</i>	list observed control variables
<i>unobserved(string)</i>	list unobserved control variables
* <i>exostate(string)</i>	list exogenous state variables
<i>endostate(string)</i>	list endogenous state variables
<i>linearapprox</i>	take a linear, rather than log-linear, approximation
<i>level(#)</i>	set credible level; default is <i>level(95)</i>
<i>noidencheck</i>	do not check for parameter identification; implied
<i>solve</i>	return model solution at initial values; implied

\**observed()* and *exostate()* are required.

*bayes: dsgenl, level()* is equivalent to *bayes, clevel(): dsgenl*.

For a detailed description of *options*, see [Options](#) in [\[DSGE\] dsgenl](#).

Options *level()*, *noidencheck*, and *stable* do not appear on the dialog box.

<i>bayesopts</i>	Description
------------------	-------------

### Priors

* <i>igammaprior(# #)</i>	specify shape and scale of default inverse-gamma prior for standard deviations of shocks; default is <i>igammaprior(0.01 0.01)</i>
<i>prior(priorspec)</i>	prior for model parameters; this option may be repeated and is required for all user-defined parameters <i>userparams</i>
<i>dryrun</i>	show model summary without estimation

### Simulation

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

### Blocking

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

### Initialization

<i>initial(initspec)</i>	specify initial values for model parameters with a single chain
<i>init#(initspec)</i>	specify initial values for #th chain; requires <i>nchains()</i>
<i>initall(initspec)</i>	specify initial values for all chains; requires <i>nchains()</i>
<i>nomleinitial</i>	suppress the use of maximum likelihood estimates as starting values
<i>initransom</i>	specify random initial values
<i>initsummary</i>	display initial values used for simulation
* <i>noisily</i>	display output from the estimation command during initialization

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>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 <code>filename.dta</code>
<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>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 `bayes` prefix; other options are common between `bayes` and `bayesmh`.

`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 user-defined parameters `userparams` and standard deviations of shocks `{sd(e.exogstate)}`. 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](#).

`nomleinitial` is assumed. Default parameter values are set to means of priors.

## 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 [DSGE] [dsgenl](#).

For a simple example of the `bayes` prefix, see *Introductory example* in [BAYES] [bayes](#). For an introduction to and examples of Bayesian DSGEs, see [DSGE] [Intro 9](#) and [DSGE] [Intro 9b](#).

## Stored results

See *Stored results* in [BAYES] [bayes](#). Also see *Stored results* in [DSGE] [dsgenl](#).

## Methods and formulas

See *Methods and formulas* in [DSGE] **dsge** and [DSGE] **Intro 9**. See *Methods and formulas* in [BAYES] **bayesmh**.

## Also see

[BAYES] **bayes: dsge postestimation** — Postestimation tools for bayes: dsge and bayes: dsngenl

[BAYES] **bayes** — Bayesian regression models using the bayes prefix<sup>+</sup>

[DSGE] **dsngenl** — Nonlinear dynamic stochastic general equilibrium 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**

Stata, Stata Press, and Mata are registered trademarks of StataCorp LLC. Stata and Stata Press are registered trademarks with the World Intellectual Property Organization of the United Nations. StataNow and NetCourseNow are trademarks of StataCorp LLC. Other brand and product names are registered trademarks or trademarks of their respective companies. Copyright © 1985–2023 StataCorp LLC, College Station, TX, USA. All rights reserved.



For suggested citations, see the FAQ on [citing Stata documentation](#).