

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

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## Description

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

*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  
*initransom* specify random initial values  
*initsummary* display initial values used for simulation  
 \**noisily* 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

[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**

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