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## Description

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

## Quick start

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

```
bayses, 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

```
bayses, 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

```
bayses, prior({rho}, uniform(0,1)) prior({alpha}, beta(5,5)): ///
    mcmcsample(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

```
bayses, 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.

```
bayses, cleavel(90) hpd
```

Also see [Quick start](#) in [\[BAYES\]](#) [bayses](#).

## 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
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### Model

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

*igammaprior(##)	specify shape and scale of default inverse-gamma prior for standard deviations of shocks; default is igammaprior(0.01 0.01)
prior( <i>priorspec</i> )	prior for model parameters; this option may be repeated and is required for all user-defined parameters <i>userparams</i>
dryrun	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( <i>paramref</i> )	specify model parameters to be excluded from the simulation results

### Blocking

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

### Initialization

initial( <i>initspec</i> )	specify initial values for model parameters with a single chain
init#( <i>initspec</i> )	specify initial values for #th chain; requires nchains()
initall( <i>initspec</i> )	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

### 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 <i>filename.dta</i>
<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>corrto1(#)</code>	specify autocorrelation tolerance; default is <code>corrto1(0.01)</code>

\* Starred options are specific to the `bayer` prefix; other options are common between `bayer` and `bayermh`.

`priorspec` and `paramref` are defined in [BAYES] `bayermh`.

`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 `bayeropts`, see *Options* in [BAYES] `bayer`.

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

## Remarks and examples

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] `bayermh`. For remarks and examples specific to the `bayer` prefix, see [BAYES] `bayer`. For details about the estimation command, see [DSGE] `dsgenl`.

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

## Stored results

See *Stored results* in [BAYES] `bayer`. 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 after Bayesian estimation

[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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