Title

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bayes: dsgenl — Bayesian nonlinear dynamic stochastic general equilibrium models

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]
```

options	Description
Model	
* `observed(`*string*`)`	list observed control variables
`unobserved(`*string*`)`	list unobserved control variables
* `exostate(`*string*`)`	list exogenous state variables
`endostate(`*string*`)`	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.

bayesopts	Description
Priors	
* `igammaprior(# #)`	specify shape and scale of default inverse-gamma prior for standard deviations of shocks; default is `igammaprior(0.01 0.01)`
`prior(`*priorspec*`)`	prior for model parameters; this option may be repeated and is required for all user-defined parameters *userparams*
`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(`*paramref*`)`	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
`initrandom`	specify random initial values
`initsummary`	display initial values used for simulation
* `noisily`	display output from the estimation command during initialization

Reporting

clevel(#)	set credible interval level; default is clevel(95)
hpd	display HPD credible intervals instead of the default equal-tailed credible intervals
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

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.

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

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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 [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: dsgenl

[BAYES] **bayes** — Bayesian regression models using the bayes prefix

[DSGE] **dsgenl** — 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**