

bayes: zinb — Bayesian zero-inflated negative binomial regression

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Description

`bayes: zinb` fits a Bayesian zero-inflated negative binomial regression to a nonnegative count outcome with a high fraction of zeros; see [\[BAYES\] bayes](#) and [\[R\] zinb](#) for details.

Quick start

Bayesian zero-inflated negative binomial regression of `y` on `x1` and `x2`, using `z` to model excess zeros and using default normal priors for regression coefficients and log-overdispersion parameter

```
bayes: zinb y x1 x2, inflate(z)
```

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

```
bayes, normalprior(10): zinb y x1 x2, inflate(z)
```

Use uniform priors for the slopes and a normal prior for the intercept of the main regression

```
bayes, prior({y: x1 x2}, uniform(-10,10)) ///
prior({y:_cons}, normal(0,10)): zinb y x1 x2, inflate(z)
```

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

```
bayes, saving(simdata) rseed(123): zinb y x1 x2, inflate(z)
```

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, mcmcsize(20000) burnin(5000) dots(500): zinb y x1 x2, inflate(z)
```

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
```

Display incidence-rate ratios instead of coefficients

```
bayes: zinb y x1 x2, inflate(z) irr
```

Display incidence-rate ratios on replay

```
bayes, irr
```

Also see [Quick start](#) in [\[BAYES\] bayes](#) and [Quick start](#) in [\[R\] zinb](#).

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Statistics > Count outcomes > Bayesian regression > Zero-inflated negative binomial regression

Syntax

```
bayes [ , bayesopts ] : zinb depvar [ indepvars ] [ if ] [ in ] [ weight ] ,
      inflate(varlist [ , offset(varname) ] | _cons) [ options ]
```

options

Description

Model

* inflate() equation that determines whether the count is zero
noconstant suppress constant term
exposure(*varname*_{*e*}) include $\ln(\text{varname}_e)$ in model with coefficient constrained to 1
offset(*varname*_{*o*}) include *varname*_{*o*} in model with coefficient constrained to 1
probit use probit model to characterize excess zeros; default is logit

Reporting

irr report incidence-rate ratios
display_options control spacing, line width, and base and empty cells
level(#) set credible level; default is `level(95)`

* inflate(*varlist* [, offset(*varname*)] | _cons) is required.

indepvars and *varlist* may contain factor variables; see [U] 11.4.3 **Factor variables**.

fweights are allowed; see [U] 11.1.6 **weight**.

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

For a detailed description of *options*, see *Options* in [R] **zinb**.

bayesopts

Description

Priors

* normalprior(#) specify standard deviation of default normal priors for regression coefficients and log-overdispersion parameter; default is `normalprior(100)`
prior(*priorspec*) prior for model parameters; this option may be repeated
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

* 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

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

Adaptation

<code><u>adaptation</u>(<i>adaptopts</i>)</code>	control the adaptive MCMC procedure
<code>scale(#)</code>	initial multiplier for scale factor; default is <code>scale(2.38)</code>
<code>covariance(<i>cov</i>)</code>	initial proposal covariance; default is the identity matrix

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>irr</code>	report incidence-rate ratios
<code>eform[(<i>string</i>)]</code>	report exponentiated coefficients and, optionally, label as <i>string</i>
<code>batch(#)</code>	specify length of block for batch-means calculations; default is <code>batch(0)</code>
<code>saving(<i>filename</i>[, <i>replace</i>])</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(#[, <i>every</i>(#)])</code>	display dots as simulation is performed
<code>[no]show(<i>paramref</i>)</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(<i>string</i>)</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(<i>search_options</i>)</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`.

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}` for the main regression and `{inflate: varlist}` for the inflation equation and log-overdispersion parameter `{lnalpha}`. 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

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 [\[R\] zinb](#).

For a simple example of the `bayes` prefix, see *Introductory example* in [\[BAYES\] bayes](#). Also see *Zero-inflated negative binomial model* in [\[BAYES\] bayes](#).

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

[\[R\] zinb](#) — Zero-inflated negative binomial regression

[\[BAYES\] 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](#)