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bayes: zip — Bayesian zero-inflated Poisson regression

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Description

bayes: zip fits a Bayesian zero-inflated Poisson regression to a nonnegative count outcome with a high fraction of zeros; see [BAYES] **bayes** and [R] **zip** for details.

Quick start

Bayesian zero-inflated Poisson regression of y on x1 and x2, using z to model excess zeros and using default normal priors for regression coefficients
    bayes: zip y x1 x2, inflate(z)

Use a standard deviation of 10 instead of 100 for the default normal priors
    bayes, normalprior(10): zip 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)): zip y x1 x2, inflate(z)

Save simulation results to simdata.dta, and use a random-number seed for reproducibility
    bayes, saving(simdata) rseed(123): zip 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): zip 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: zip 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] **zip**.

Menu

Statistics > Count outcomes > Bayesian regression > Zero-inflated Poisson regression

Syntax

> bayes $\left[\, , \text{ } bayesopts \,\right]$: zip *depvar* $\left[\, indepvars \,\right]$ $\left[\, if \,\right]$ $\left[\, in \,\right]$ $\left[\, weight \,\right]$,
>
>   inflate(*varlist* $\left[\, , \text{ } \underline{\text{off}}\text{set}(varname) \,\right]$ | _cons) $\left[\, options \,\right]$

options	Description
[Model]	
* <u>inf</u>late()	equation that determines whether the count is zero
noconstant	suppress constant term
exposure(*varname$_e$*)	include ln(*varname$_e$*) in model with coefficient constrained to 1
<u>off</u>set(*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
<u>l</u>evel(#)	set credible level; default is level(95)

* <u>inf</u>late(*varlist* $\left[\, , \text{ } \underline{\text{off}}\text{set}(varname) \,\right]$ | _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: zip, level() is equivalent to bayes, clevel(): zip.

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

bayesopts	Description
[Priors]	
* <u>normalprior</u>(#)	specify standard deviation of default normal priors for regression coefficients; 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* $\left[\, , \text{ } blockopts \,\right]$)	specify a block of model parameters; this option may be repeated
blocksummary	display block summary
* noblocking	do not block parameters by default

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

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

[Reporting]
<u>clevel</u>(#)	set credible interval level; default is clevel(95)
hpd	display HPD credible intervals instead of the default equal-tailed credible intervals
* irr	report incidence-rate ratios
<u>eform</u>[(*string*)]	report exponentiated coefficients and, optionally, label as *string*
<u>batch</u>(#)	specify length of block for batch-means calculations; default is batch(0)
<u>saving</u>(*filename*[, replace])	save simulation results to *filename*.dta
<u>nomodelsummary</u>	suppress model summary
<u>chainsdetail</u>	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
<u>notable</u>	suppress estimation table
<u>noheader</u>	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]
<u>search</u>(*search_options*)	control the search for feasible initial values
<u>corrlag</u>(#)	specify maximum autocorrelation lag; default varies
<u>corrtol</u>(#)	specify autocorrelation tolerance; default is corrtol(0.01)

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*Starred options are specific to the bayes prefix; other options are common between bayes and [bayesmh](BAYES).

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. 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] **zip**.

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] **zip** — Zero-inflated Poisson 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**