bayes: zip — Bayesian zero-inflated Poisson regression

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 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% 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
## bayes: zip — Bayesian zero-inflated Poisson regression

**Syntax**

\[
\text{bayes} [\text{, bayesopts}] \colon \text{zip depvar} [\text{ indepvars}] [\text{ if}] [\text{ in}] [\text{ weight}], \\
\text{inflate(varlist[, offset(varname) ]|_cons)} [\text{ options}]
\]

<table>
<thead>
<tr>
<th>options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
</tr>
<tr>
<td>\text{*inflate( )}</td>
<td>equation that determines whether the count is zero</td>
</tr>
<tr>
<td>\text{noconstant}</td>
<td>suppress constant term</td>
</tr>
<tr>
<td>\text{exposure(varname)}</td>
<td>include In(varname) in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>\text{offset(varname)}</td>
<td>include varname in model with coefficient constrained to 1</td>
</tr>
<tr>
<td>\text{probit}</td>
<td>use probit model to characterize excess zeros; default is logit</td>
</tr>
<tr>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>\text{irr}</td>
<td>report incidence-rate ratios</td>
</tr>
<tr>
<td>\text{display_options}</td>
<td>control spacing, line width, and base and empty cells</td>
</tr>
<tr>
<td>\text{level(#)}</td>
<td>set credible level; default is level(95)</td>
</tr>
<tr>
<td>**\text{influence(varlist[, offset(varname) ]</td>
<td>_cons)}** is required.</td>
</tr>
<tr>
<td>\text{indepvars} and varlist may contain factor variables; see \text{[U 11.4.3 Factor variables].}</td>
<td></td>
</tr>
<tr>
<td>fweights are allowed; see \text{[U 11.1.6 weight].}</td>
<td></td>
</tr>
<tr>
<td>bayes: zip, level() is equivalent to bayes, clevel(): zip.</td>
<td></td>
</tr>
<tr>
<td>For a detailed description of options, see \text{Options in [R] zip.}</td>
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**bayesopts**

<table>
<thead>
<tr>
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<tr>
<td><strong>\text{<strong>normalprior(#)</strong>}</strong></td>
</tr>
<tr>
<td>\text{prior(priorspec)}</td>
</tr>
<tr>
<td>\text{dryrun}</td>
</tr>
<tr>
<td>Simulation</td>
</tr>
<tr>
<td>\text{nchains(#)}</td>
</tr>
<tr>
<td>\text{mcmcsize(#)}</td>
</tr>
<tr>
<td>\text{burnin(#)}</td>
</tr>
<tr>
<td>\text{thinning(#)}</td>
</tr>
<tr>
<td>\text{rseed(#)}</td>
</tr>
<tr>
<td>\text{exclude(paramref)}</td>
</tr>
<tr>
<td>Blocking</td>
</tr>
<tr>
<td>\text{blocksize(#)}</td>
</tr>
<tr>
<td>block(paramref[, blockopts])</td>
</tr>
<tr>
<td>\text{blocksummary}</td>
</tr>
<tr>
<td>\text{<strong>noblocking</strong>}</td>
</tr>
</tbody>
</table>
Initialization

initial(initspec) specify initial values for model parameters with a single chain
init#(initspec) specify initial values for #th chain; requires nchains()
nomleinitial suppress the use of maximum likelihood estimates as starting values
initsummary display initial values used for simulation
initrandom specify random initial values
initall(initspec) specify initial values for all chains; requires nchains()

*noisily display output from the estimation command during initialization

Adaptation

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

clevel(#) 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
eform[(string)] report exponentiated coefficients and, optionally, label as string
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.

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.

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