Description

bayes: biprobit fits a Bayesian bivariate probit regression to two binary outcomes; see [BAYES] bayes and [R] biprobit for details.

Quick start

Bayesian bivariate probit regression of y1 and y2 on x1 and x2, using default normal priors for regression coefficients and atanh-transformed correlation

    bayes: biprobit y1 y2 x1 x2

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

    bayes, normalprior(10): biprobit y1 y2 x1 x2

Use uniform priors for the slopes and a normal prior for the intercept of the dependent variable y2

    bayes, prior({y2: x1 x2}, uniform(-10,10)) ///
    prior({y2: _cons}, normal(0,10)): biprobit y1 y2 x1 x2

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

    bayes, saving(simdata) rseed(123): biprobit y1 y2 x1 x2

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): biprobit y1 y2 x1 x2

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

Bayesian seemingly unrelated bivariate probit regression using default priors

    bayes: biprobit (y1 = x1 x2 x3) (y2 = x1 x2)

Also see Quick start in [BAYES] bayes and Quick start in [R] biprobit.

Menu

Statistics > Binary outcomes > Bayesian regression > Bivariate probit regression

Statistics > Binary outcomes > Bayesian regression > Seemingly unrelated bivariate probit
Syntax

Bayesian bivariate probit regression

\[
\text{bayes [}, \text{bayesopts} \text{]}: \text{biprobit } \text{depvar}_1 \text{ depvar}_2 [ \text{indepvars} ] [ \text{if} ] [ \text{in} ] [ \text{weight} ] \\
[ , \text{options} ]
\]

Bayesian seemingly unrelated bivariate probit regression

\[
\text{bayes [}, \text{bayesopts} \text{]}: \text{biprobit } \text{equation}_1 \text{ equation}_2 [ \text{if} ] [ \text{in} ] [ \text{weight} ] [ , \text{options} ]
\]

where \( \text{equation}_1 \) and \( \text{equation}_2 \) are specified as

\[
( [ \text{eqname:} ] \text{depvar} [=] \text{indepvars} [ , \text{noconstant offset(varname)} ] )
\]

options Description

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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<tr>
<td>noconstant</td>
<td>suppress constant term</td>
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<tr>
<td>offset1(varname)</td>
<td>offset variable for first equation</td>
</tr>
<tr>
<td>offset2(varname)</td>
<td>offset variable for second equation</td>
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</tbody>
</table>

Reporting

display_options control spacing, line width, and base and empty cells

level(#) set credible level; default is level(95)

| indepvars may contain factor variables; see [U] 11.4.3 Factor variables. |
| depvar\(_1\), depvar\(_2\), depvar, and indepvars may contain time-series operators; see [U] 11.4.4 Time-series varlists. |
| fweights are allowed; see [U] 11.1.6 weight. |
| bayes: biprobit, level() is equivalent to bayes, clevel(): biprobit. |

For a detailed description of options, see Options in [R] biprobit. Options noconstant, offset1(), and offset2() are not allowed with seemingly unrelated bivariate probit regression.

bayesopts Description

<table>
<thead>
<tr>
<th>Priors</th>
<th>Description</th>
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<tr>
<td>*normalprior(#)</td>
<td>specify standard deviation of default normal priors for regression coefficients and atanh-transformed correlation; default is normalprior(100)</td>
</tr>
<tr>
<td>prior(priorspec)</td>
<td>prior for model parameters; this option may be repeated</td>
</tr>
<tr>
<td>dryrun</td>
<td>show model summary without estimation</td>
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<table>
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<tr>
<th>Simulation</th>
<th>Description</th>
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<tr>
<td>nchains(#)</td>
<td>number of chains; default is to simulate one chain</td>
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<tr>
<td>mcmcsize(#)</td>
<td>MCMC sample size; default is mcmcsize(10000)</td>
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<tr>
<td>burnin(#)</td>
<td>burn-in period; default is burnin(2500)</td>
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<tr>
<td>thinning(#)</td>
<td>thinning interval; default is thinning(1)</td>
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<tr>
<td>rseed(#)</td>
<td>random-number seed</td>
</tr>
<tr>
<td>exclude(paramref)</td>
<td>specify model parameters to be excluded from the simulation results</td>
</tr>
</tbody>
</table>
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

`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

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

Reporting

`clevel(#)` set credible interval level; default is `clevel(95)`

`hpd` display HPD credible intervals instead of the default equal-tailed credible intervals

`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 \( \{ \text{depvar}_1 : \text{indepvars} \} \) and \( \{ \text{depvar}_2 : \text{indepvars} \} \) and atanh-transformed correlation \( \{ \text{athrho} \} \). Use the \texttt{dryrun} option to see the definitions of model parameters prior to estimation.

For a detailed description of \textit{bayesopts}, see \textit{Options} in \texttt{[BAYES] bayes}.

**Remarks and examples**

For a general introduction to Bayesian analysis, see \texttt{[BAYES] Intro}. For a general introduction to Bayesian estimation using an adaptive Metropolis–Hastings algorithm, see \texttt{[BAYES] bayesmh}. For remarks and examples specific to the \texttt{bayes} prefix, see \texttt{[BAYES] bayes}. For details about the estimation command, see \texttt{[R] biprobit}.

For a simple example of the \texttt{bayes} prefix, see \textit{Introductory example} in \texttt{[BAYES] bayes}.

**Stored results**

See \textit{Stored results} in \texttt{[BAYES] bayes}.

**Methods and formulas**

See \textit{Methods and formulas} in \texttt{[BAYES] bayesmh}.

**Also see**

- \texttt{[BAYES] bayes} — Bayesian regression models using the bayes prefix
- \texttt{[R] biprobit} — Bivariate probit regression
- \texttt{[BAYES] Bayesian postestimation} — Postestimation tools for bayesmh and the bayes prefix
- \texttt{[BAYES] Bayesian estimation} — Bayesian estimation commands
- \texttt{[BAYES] Bayesian commands} — Introduction to commands for Bayesian analysis
- \texttt{[BAYES] Intro} — Introduction to Bayesian analysis
- \texttt{[BAYES] Glossary}