

# Package ‘rstanemax’

May 31, 2019

**Version** 0.1.0

**Title** Emax Model Analysis with 'Stan'

**Description** Perform sigmoidal Emax model fit using 'Stan' in a formula notation, without writing 'Stan' model code.

**Encoding** UTF-8

**License** GPL-3 | file LICENSE

**LazyData** true

**ByteCompile** true

**Depends** R (>= 3.4.0), methods, Rcpp (>= 1.0.0)

**Imports** rstan (>= 2.18.2), rstantools (>= 1.5.1), magrittr (>= 1.5),  
dplyr (>= 0.8.0), tidyr (>= 0.8.0), ggplot2 (>= 2.2.1)

**LinkingTo** StanHeaders (>= 2.18.1), rstan (>= 2.18.2), BH (>= 1.69.0-1), Rcpp (>= 1.0.0), RcppEigen (>= 0.3.3.5.0)

**SystemRequirements** GNU make

**NeedsCompilation** yes

**RoxygenNote** 6.1.1

**Suggests** testthat, knitr, rmarkdown, spelling

**VignetteBuilder** knitr

**Language** en-US

**URL** <https://github.com/yoshidk6/rstanemax>

**BugReports** <https://github.com/yoshidk6/rstanemax/issues>

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R/stanmodels.R)

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**Repository** CRAN

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rstanemax-package	<i>The 'rstanemax' package.</i>
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### Description

Perform sigmoidal Emax model fit using Stan without writing Stan model code.

### References

Stan Development Team (2018). RStan: the R interface to Stan. R package version 2.18.2.  
<http://mc-stan.org>

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exposure.response.sample	<i>Sample simulated data for exposure-response.</i>
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### Description

Sample simulated data for exposure-response.

### Usage

```
exposure.response.sample
```

### Format

A data frame with columns:

**dose** Dose levels used for simulation of pharmacokinetics

**exposure** Simulated exposure

**response** Simulated pharmacodynamic response

### Examples

```
exposure.response.sample
```

---

posterior\_predict      *Outcome prediction from posterior distribution of parameters*

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### Description

Compute outcome predictions using posterior samples. Exposure data for prediction can be either original data used for model fit or new data.

### Usage

```
## S3 method for class 'stanemax'
posterior_predict(object, newdata = NULL,
  returnType = c("matrix", "dataframe", "tibble"), ...)

posterior_predict_quantile(object, newdata = NULL, ci = 0.9,
  pi = 0.9)
```

### Arguments

object	A 'stanemax' class object
newdata	An optional data frame with a column named 'exposure' or a numeric vector
returnType	An optional string specifying the type of return object.
...	Additional arguments passed to methods.
ci	Credible interval of the response without residual variability.
pi	Prediction interval of the response with residual variability.

### Details

Run `vignette("emaxmodel", package = "rstanemax")` to see how you can use the posterior prediction for plotting estimated Emax curve.

### Value

An object that contain predicted response with posterior distribution of parameters. The default is a matrix containing predicted response. Each row of the matrix is a vector of predictions generated using a single draw of the model parameters from the posterior distribution.

If either `_dataframe_` or `_tibble_` is specified, the function returns a data frame or tibble object in a long format - each row is a prediction generated using a single draw of the model parameters and a corresponding exposure.

Two types of predictions are generated with this function. `_respHat_` corresponds to the prediction without considering residual variability and is intended to provide credible interval of "mean" response. `_response_` include residual variability in its calculation, therefore the range represents prediction interval of observed response.

The return object also contains exposure and parameter values used for calculation.

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stanemax-methods      *Methods for stanemax objects*

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### Description

Methods for stanemax objects

### Usage

```
## S3 method for class 'stanemax'
print(x, ...)

## S3 method for class 'stanemax'
plot(x, show.ci = TRUE, show.pi = FALSE, ...)
```

### Arguments

x	An object of class 'stanemax'
...	Additional arguments passed to methods.
show.ci	An logical specifying if the output figure include credible interval of posterior prediction. Default TRUE.
show.pi	An logical specifying if the output figure include prediction interval. Default FALSE.

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stan\_emax      *Bayesian Emax model fit with Stan*

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### Description

Run sigmoidal Emax model fit with formula notation

### Usage

```
stan_emax(formula, data, gamma.fix = 1, e0.fix = NULL, priors = NULL,
...)
```

### Arguments

formula	a symbolic description of variables for Emax model fit.
data	an optional data frame containing the variables in the model.
gamma.fix	a numeric or NULL to specify gamma (Hill coefficient) in the sigmoidal Emax model. If NULL, gamma will be estimated from the data. If numeric, gamma is fixed at the number provided. Default = 1 (normal Emax model).

<code>e0.fix</code>	a numeric or NULL to specify E0 in the Emax model. If NULL, E0 will be estimated from the data. If numeric, E0 is fixed at the number provided. Default = NULL (estimate from the data).
<code>priors</code>	a named list specifying priors of parameters (ec50, emax, e0, gamma, sigma). Each list item should be length 2 numeric vector, one corresponding to mean and another corresponding to standard deviation. Currently only supports normal distribution for priors.
<code>...</code>	Arguments passed to <code>'rstan::sampling'</code> (e.g. iter, chains).

**Value**

An object of class `'stanemax'`

**Examples**

```
data(exposure.response.sample)
fit1 <- stan_emax(response ~ exposure, data = exposure.response.sample,
  # the next line is only to make the example go fast enough
  chains = 1, iter = 500, seed = 12345)
print(fit1)

# Set priors manually, also estimate gamma instead of the default of fix to 1
fit2 <- stan_emax(response ~ exposure, data = exposure.response.sample, gamma.fix = NULL,
  priors = list(ec50 = c(100, 30), emax = c(100, 30), e0 = c(10, 5),
    gamma = c(0, 3), sigma = c(0, 30)),
  # the next line is only to make the example go fast enough
  chains = 1, iter = 500, seed = 12345)
print(fit2)
```

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