Package 'BANMA'

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Type Package

Title Bayesian Estimation and Prediction for Network Meta-Analysis with Non-Informative Priors

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Description
Bayesian estimation and prediction for network meta-analysis with non-informative prior distributions are implementable. Various proper and improper prior distributions are available. The posterior sampling does not require formal convergence checks of MCMC.

Depends R (>= 3.5.0)

Imports stats, MASS, invgamma

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

R topics documented:

BANMA-package   *The 'BANMA' package.*

Description

Bayesian Estimation and Prediction for Network Meta-Analysis with Non-Informative Priors.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

---

data.edit   *Transforming arm-level data to contrast-based summary statistics*

Description

Transforming arm-level data to contrast-based summary statistics.

Usage

```
data.edit(study,trt,d,n)
```

Arguments

study	Study ID
trt	Numbered treatment (=1,2,...)
d	Number of events
n	Sample size

Value

Contrast-based summary statistics are generated.

- y: Contrast-based summary estimates.
- S: Vectored within-study covariance matrix.

Examples

```
data(diabetes)
attach(diabetes)

edat <- data.edit(study,trt,d,n)
```

---

diabetes   *Elliott and Mayer (2007)'s network meta-analysis data*

Description

- study: Study ID
- trt: Numbered treatment (1:Diuretic, 2:ACE inhibitor, 3:ARB, 4:Beta blocker, 5:Calcium-channel blocker, 6:Placebo)
- n: Sample size
- d: Number of events

Usage

```
data(diabetes)
```

Format

A arm-based dataset with 22 rows and 4 variables

References

Elliott, W. J., and Meyer, P. M. (2007). Incident diabetes in clinical trials of antihypertensive drugs: a network meta-analysis. *Lancet.* **369**: 201-207.

---

rinvGamma   *Posterior sampling of* tau2 *and* tau *for the multivariate random-effects model using the inverse-gamma prior distribution*

Description

Posterior sampling of tau2 and tau for the multivariate random-effects model using the inverse-gamma prior distribution.

Usage

```
runif_tau(y, S, shape=0.001,scale=0.001, B=10000, n.grid=10^4)
```

Arguments

y	Contrast-based summary data of the outcome measure
S	Covariance estimates of y
B	Number of posterior samples to be generated.
shape	Shape parameter of the prior inverse-gamma distribution (default:0.001).
scale	Scale parameter of the prior inverse-gamma distribution (default:0.001).
n.grid	Number of grids for the numerical integration (default:10000).

Value

Posterior samples of `tau2` and `tau` and their summaries.

- `tau2`: Posterior samples of `tau2`.

- `tau`: Posterior samples of `tau`.

- `post.summary`: Summary of the posterior samples of `tau2` and `tau`.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

# Generating the posterior samples of tau2
R1 <- rinvGamma(y,S,B=20000)
R1$post.summary
```

---

rjeffreys	*Posterior sampling of* tau2 *and* tau *for the multivariate random-effects model using the Jeffreys prior*

Description

Posterior sampling of `tau2` and `tau` for the multivariate random-effects model using the Jeffreys prior.

Usage

```
rjeffreys(y, S, B=10000, n.grid=10^4)
```

Arguments

y	Contrast-based summary data of the outcome measure
S	Covariance estimates of y
B	Number of posterior samples to be generated.
n.grid	Number of grids for the numerical integration (default:10000).

Value

Posterior samples of `tau2` and `tau` and their summaries.

- `tau2`: Posterior samples of `tau2`.
- `tau`: Posterior samples of `tau`.
- `post.summary`: Summary of the posterior samples of `tau2` and `tau`.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

# Generating the posterior samples of tau2
R1 <- rjeffreys(y,S,B=20000)
R1$post.summary
```

---

rmu | *Posterior sampling of* mu *and* theta_new *for the multivariate random-effects model*

Description

Posterior sampling of `mu` and `theta_new` for the multivariate random-effects model.

Usage

```
rmu(y, S, rtau2)
```

Arguments

y   Contrast-based summary data of the outcome measure

S   Covariance estimates of y

rtau2   Posterior samples from the marginal posterior distribution of `tau^2`.

Value

Posterior samples of `mu` and `theta_new` and their summaries.

- `mu`: Posterior samples of `mu`.
- `theta_new`: Posterior samples of `theta_new`.
- `mu_summary`: Summary of the posterior samples of `mu`.
- `theta.new_summary`: Summary of the posterior samples of `theta_new`.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

# Generating the posterior samples of tau2
R1 <- runif_tau2(y,S,B=20000)
R1$post.summary

rtau2 <- R1$tau2

# Generating the posterior samples of mu and theta_new
# The number of samples are determined to be equal to that of rtau2.
R2 <- rmu(y,S,rtau2)
R2$mu_summary
R2$theta.new_summary
```

---

rmvmeta   *The ordinary REML estimation of network meta-analysis*

Description

The ordinary REML estimation of network meta-analysis.

Usage

```
rmvmeta(y, S)
```

Arguments

y	Contrast-based summary data of the outcome measure
S	Covariance estimates of y

Value

The REML estimates with 95%confidence intervals and ordinary t-approximation prediction intervals for network meta-analysis.

- `Estimates`: Restricted maximum likelihood (REML) estimates, their SE, and Wald-type 95% confidence intervals.
- `Between-studies_SD`: Between-studies SD estimate.
- `95%PI`: 95% prediction intervals by the ordinary t-approximation.

References

Cooper, H., Hedges, L. V., and Valentine, J. C. (2009). *The Handbook of Research Synthesis and Meta-Analysis*, 2nd edition. New York: Russell Sage Foundation.

White, I. R. (2015). Network meta-analysis. *Stata Journal* **15**, 951-985.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

rmvmeta(y,S)   # Results of the NMA analysis (log OR scale)
```

---

runif_tau	*Posterior sampling of* tau2 *and* tau *for the multivariate random-effects model using improper uniform prior for the scale of* tau

---

Description

Posterior sampling of tau2 and tau for the multivariate random-effects model for the scale of tau.

Usage

```
runif_tau(y, S, B=10000, n.grid=10^4)
```

Arguments

y	Contrast-based summary data of the outcome measure
S	Covariance estimates of y
B	Number of posterior samples to be generated.
n.grid	Number of grids for the numerical integration (default:10000).

Value

Posterior samples of tau2 and tau and their summaries.

- tau2: Posterior samples of tau2.
- tau: Posterior samples of tau.
- post.summary: Summary of the posterior samples of tau2 and tau.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

# Generating the posterior samples of tau2
R1 <- runif_tau(y,S,B=20000)
R1$post.summary
```

---

runif_tau2   *Posterior sampling of* tau2 *and* tau *for the multivariate random-effects model using improper uniform prior for the scale of* tau2

Description

Posterior sampling of tau2 and tau for the multivariate random-effects model for the scale of tau2.

Usage

```
runif_tau2(y, S, B=10000, n.grid=10^4)
```

Arguments

y	Contrast-based summary data of the outcome measure
S	Covariance estimates of y
B	Number of posterior samples to be generated.
n.grid	Number of grids for the numerical integration (default:10000).

Value

Posterior samples of tau2 and tau and their summaries.

- tau2: Posterior samples of tau2.
- tau: Posterior samples of tau.
- post.summary: Summary of the posterior samples of tau2 and tau.

References

Noma, H. (2022+). Bayesian estimation and prediction for network meta-analysis with non-informative priors. Forthcoming.

Examples

```
data(diabetes)
attach(diabetes)

# Transforming the arm-level data to the contrast-based summaryies
edat <- data.edit(study,trt,d,n)

y <- edat$y
S <- edat$S

# Generating the posterior samples of tau2
R1 <- runif_tau2(y,S,B=20000)
R1$post.summary
```

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