1 Function: BF_repl_es

Description. Estimates the Bayes factors BF_{12} and BF_{13} for one original and one replication data set comparing two group means. This function makes use of the function sampler_ESrepl. Priors are defined in the manuscript.

Usage. BF_repl_es(data_orig,data_repl,ddiff,iter)

Arguments.

data_orig	Original study data matrix with n rows and 3 columns: [,1] contains all outcome values y_i, [,2] and [,3] are used to identify the group membership of each case. For cases in Group 1: [,2:3] = c(1,0), while for cases in Group 2: [,2:3] = c(0,1).
data_repl	Replication study data matrix with n rows and 3 columns: [,1] contains all outcome values y_i, [,2] and [,3] are used to identify the group membership of each case. For cases in Group 1: [,2:3] = c(1,0), while for cases in Group 2: [,2:3] = c(0,1).
d_diff	ϕ
iter	Number of iterations including burn-in (standard = 10,000 iterations for burn-in).

Returned object.

BF12, BF13, BF23	Bayes factors that quantify the relative evidence for H_1 to H_2, H_1 to H_3, and H_2 to H_3 respectively.
orig, repl_H1, repl_H2, repl_H3	sampler_ESrepl objects for the original data, and analysis under all three hypotheses (see returned object sampler_ESrepl for more information).

Worked out example in R.

```
# load data
data1 <- read.table(``path to original data set'',header=T/F)
data2 <- read.table(``path to replication data set'', header=T/F)
# run function for φ = 0.50 and 20,000 iterations including
# burn-in of 10,000 iterations.  This may take a while.
result <- BF_repl_es(data_orig = data1, data_repl = data2, ddiff
= 0.5, iter = 20000)
# create plot of competing hypotheses on δ_repl
#(see Function:  plot_prior).
plot_prior(result)
```

2 Function: sampler_ESrepl

Description. MCMC sampler and calculation of marginal likelihood for the comparison of two group means, with prior distributions on μ_1, δ, and σ^2.
Usage. sampler_ESrepl (data, burnin=10000, iterations=20000, prior, type, Htype=1, assessment_values="auto", d_diff=0)
Arguments.

data	Data matrix with n rows and 3 columns: [,1] contains all outcome values y_i, [,2] and [,3] are used to identify the group membership of each case. For cases in Group 1: [,2:3] = c(1,0), while for cases in Group 2: [,2:3] = c(0,1).
burnin	The number of joint posterior parameter draws (iterations) that should be discarded for calculations based on the posterior distribution(s).
iterations	The number of joint posterior parameter draws including burnin.
prior	2x3 matrix. The rows constitute the parameters μ_1, δ, and σ^2. The columns are used to specify the prior parameters: the prior mean and standard deviations for μ_1 and δ, and the prior shape and rate for σ^2. For H_2, [2,2] contains γ.
type	("orig","repl")
Htype	(1=unimodal Gaussian prior for δ, 2=Gaussian mixture prior for δ) Under H_1 and H_3 the Htype=1, while Htype=2 under H_2.
assessment_values	Set of assessment that are used to estimate the marginal likelihood (Chib & Jeliazkov, 2001). If assessment_values="auto" the means of the posterior distributions are set to be the assessment values.
d_diff	ϕ

Returned object.

Gibbs   Matrix containing all posterior parameter draws ([,1] for μ_1, [,2] for δ, and [,3] for σ^2 including burn-in.)

MH   [,1] iteration candidate σ^2, [,2] probability α of selecting the iteration candidate over the iteration draw $\alpha(\sigma^2_{(g)}, \sigma^2_{(j)})$, [,3] probability of selecting the assessment value over the iteration candidate $\alpha(\sigma^2_{(g)}, \sigma^2_*)$, [,4] $\alpha(\sigma^2_{(g)}, \sigma^2_*)$ times the probability of selecting the assessment value in the proposal distribution $q(\sigma^2_*)$, [,5] probability of selecting the assessment value over the iteration draw $\alpha(\sigma^2_{(j)}, \sigma^2_*)$.

posterior_summary   posterior estimates and standard deviations of the parameters μ_1, δ, and σ^2.

Chib_ln   List containing the estimates of all components of equation XX.

marginal   Value of $\ln m(\boldsymbol{y}|H_k)$.

phi ϕ.

prior   Prior as defined by user input.

iterations   Number of iterations including burnin as defined by user input.

burnin   Number of iterations that were discarded in calculating elements of the marginal distribution of the data, as defined by user input.

Note: If type="orig" only Gibbs, MH[,1:2], the posterior summary, and information on the prior are returned.

3   Function: plot_prior

Description. Creates a plot of the three prior distributions for δ_{repl} that were used to analyze the data.

Usage. plot_prior(output)

Arguments.

output   An object that was returned by the function BF_repl_es.

Returned object.

This function creates a plot in the plot window in RStudio. If no plot shows, please delete all plots that were created previously from the plot output window and run the function again.