Package ‘mvtmeta’

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Title Multivariate Meta-Analysis
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Author Han Chen
Maintainer Han Chen <Han.Chen.2@uth.tmc.edu>
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mvtmeta-package Multivariate meta-analysis

Description

This package contains functions to run fixed effects or random effects multivariate meta-analysis.
Details

Package: mvtmeta
Type: Package
Version: 1.1
Date: 2020-02-11
License: GPL-3

Use the function mvtmeta_fe to run the fixed effects multivariate meta-analysis. Use the function mvtmeta_re to run the random effects multivariate meta-analysis.

Author(s)

Han Chen
Maintainer: Han Chen <hanchen@bu.edu>

References


Examples

```r
y <- matrix(c(0.3161, 7.4015, 0.4278,
              -0.3201, 6.9426, -0.9816,
              0.6983, 4.6680, -0.2415,
              3.2736, 4.3080, 0.2052,
              -0.1599, 5.6398, -0.6782,
              -0.6989, 6.3158, -0.7918,
              -3.6094, 9.3429, -2.8711,
              0.2172, 6.4078, -0.6093), 3, 8)
cov <- array(c(2.3568, -1.2105, 0.8524, -1.2105, 9.7029,
               -6.1753, 0.8524, -6.1753, 4.4114,
               0.2529, 0.1498, -0.1019, 0.1498, 0.7016,
               -0.4167, -0.1019, -0.4167, 0.2743,
               0.1444, -0.0652, 0.0433, -0.0652, 0.6481,
               -0.3899, 0.0433, -0.3899, 0.2608,
               3.8428, -4.5587, 3.2892, -4.5587, 10.3517,
               -6.6684, 3.2892, -6.6684, 4.8268,
               0.1161, -0.0992, 0.0645, -0.0992, 0.4363,
               -0.2610, 0.0645, -0.2610, 0.1733,
               0.1603, 0.0242, -0.0129, 0.0242, 0.7697,
               -0.4686, -0.0129, -0.4686, 0.3180,
               3.2054, -1.1984, 0.8437, -1.1984, 17.8889,
               -10.7697, 0.8437, -10.7697, 7.2101,
               0.0278, 0.0136, -0.0091, 0.0136, 0.1184,
               -0.0716, -0.0091, -0.0716, 0.0482), c(3, 3, 8))
fe <- mvtmeta_fe(y, cov)
re <- mvtmeta_re(y, cov)
```
Fixed effects multivariate meta-analysis.

Description

This function computes the effect estimates and their covariance matrix for fixed effects multivariate meta-analysis, which is an extension of the inverse-variance fixed effects meta-analysis in the univariate case.

Usage

mvtmeta_fe(y, cov)

Arguments

y A matrix. Each column represents observed effect estimates in each study.
cov An array with the first two dimensions equal to the number of effects, and the third dimension equal to the number of studies. Each stratum is a symmetric, positive definite matrix representing corresponding covariance matrix from each study.

Details

This function is a multivariate extension of the inverse-variance fixed effects meta-analysis. It computes the summary effect estimates and their covariance matrix using observed study-specific effect estimates and covariance matrices. Please make sure that the orders of effects and studies in y and cov match.

Please note that fixed effects meta-analysis may provide invalid results when heterogeneity is present.

Value

beta Summary effect estimates from meta-analysis.
cov The covariance matrix for the summary effect estimates.

Author(s)

Han Chen

References


See Also

mvtmeta_re
Examples

```r
y <- matrix(c(0.3161, 7.4015, 0.4278,
               -0.3201, 6.9426, -0.9816,
               3.2736, 4.3080, 0.2052,
               -0.1599, 5.6398, -0.6782,
               -0.6983, 6.3158, -0.7918,
               -3.6094, 9.3429, -2.8711,
               0.2172, 6.4078, -0.6093), 3, 8)
cov <- array(c(2.3568, -1.2105, 0.8524, -1.2105, 9.7029,
              -6.1753, 0.8524, -6.1753, 4.4114,
              0.2529, 0.1498, -0.1019, 0.1498, 0.7016,
              -0.4167, -0.1019, -0.4167, 0.2743,
              0.1444, -0.0652, 0.0433, -0.0652, 0.6481,
              -0.3899, 0.0433, -0.3899, 0.2608,
              3.8428, -4.5587, 3.2892, -4.5587, 10.3517,
              -6.6684, 3.2892, -6.6684, 4.8268,
              0.1161, -0.0992, 0.0645, -0.0992, 0.4363,
              -0.2610, 0.0645, -0.2610, 0.1733,
              0.1603, 0.0242, -0.0129, 0.0242, 0.7697,
              -0.4686, -0.0129, -0.4686, 0.3180,
              3.2054, -1.1984, 0.8437, -1.1984, 17.8889,
              -10.7697, 0.8437, -10.7697, 7.2101,
              0.0278, 0.0136, -0.0091, 0.0136, 0.1184,
              -0.0716, -0.0091, -0.0716, 0.0482), c(3, 3, 8))
fe <- mvtmeta_re(y, cov)
fe
```

Description

This function computes the effect estimates, their covariance matrix and between-study covariance matrix for random effects multivariate meta-analysis.

Usage

```r
mvtmeta_re(y, cov)
```

Arguments

- `y`: A matrix. Each column represents observed effect estimates in each study.
- `cov`: An array with the first two dimensions equal to the number of effects, and the third dimension equal to the number of studies. Each stratum is a symmetric, positive definite matrix representing corresponding covariance matrix from each study.
This function performs random effects multivariate meta-analysis. It computes the between-study covariance matrix as a method of moments estimate (Chen et al., 2012), which is a multivariate extension of DerSimonian and Laird’s estimator in the univariate case. The computation does not require permutation.

If the between-study covariance matrix is not positive semi-definite (usually due to low heterogeneity or small number of studies), it is automatically fixed to be a positive semi-definite estimate by eigendecomposition and setting negative eigenvalues to 0.

This function then computes the summary effect estimates and their covariance matrix based on the random effects multivariate meta-analysis method and the positive semi-definite between-study covariance matrix estimate.

**Value**

- **beta**: Summary effect estimates from meta-analysis.
- **cov**: The covariance matrix for the summary effect estimates.
- **between**: The between-study covariance matrix estimate.
- **negeigen**: Number of negative eigenvalues of the original between-study covariance matrix estimate.

**Author(s)**

Han Chen

**References**


**See Also**

- `mvtmeta_fe`

**Examples**

```r
y <- matrix(c(0.3161, 7.4015, 0.4278,  
-0.3201, 6.9426, -0.9816, 
0.6983, 4.6680, -0.2415, 
3.2736, 4.3080, 0.2052,  
-0.1599, 5.6398, -0.6782, 
0.6983, 6.3158, -0.7918, 
-3.6094, 9.3429, -2.8711,  
0.2172, 6.4078, -0.6093), 3, 8)
cov <- array(c(2.3568, -1.2105, 0.8524, -1.2105, 9.7029,  
-6.1753, 4.6680, -0.2415, 
0.2529, 0.1498, -0.1019, 0.1498, 0.7016,  
-0.4167, -0.1019, -0.4167, 0.2743,  
0.1444, -0.0652, 0.0433, -0.0652, 0.6481,  
-0.3899, 0.0433, -0.3899, 0.2608), 
3, 8)
```
re <- mvtmeta_re(y, cov)
re
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