

# Package ‘mvtmeta’

February 20, 2015

**Type** Package  
**Title** Multivariate meta-analysis  
**Version** 1.0  
**Date** 2012-07-09  
**Depends** gtools  
**Author** Han Chen  
**Maintainer** Han Chen <hanchen@bu.edu>  
**Description** This package contains functions to run fixed effects or random effects multivariate meta-analysis.  
**License** GPL (>= 2)  
**LazyLoad** yes  
**Repository** CRAN  
**Date/Publication** 2012-07-10 05:51:06  
**NeedsCompilation** no

## R topics documented:

mvtmeta-package . . . . .	1
mvtmeta_fe . . . . .	3
mvtmeta_re . . . . .	4

<b>Index</b>	<b>7</b>
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mvtmeta-package	<i>Multivariate meta-analysis</i>
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## Description

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

## Details

```

Package:    mvtmeta
Type:      Package
Version:    1.0
Date:      2012-07-09
License:    GPL (>= 2)
LazyLoad:  yes

```

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

Chen H, Manning AK, Dupuis J. A method of moments estimator for random effect multivariate meta-analysis. *Biometrics* (Epub May 2, 2012)

### Examples

```

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)

```

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`mvtmeta_fe`*Fixed effects multivariate meta-analysis.*

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## 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

<code>y</code>	A matrix. Each column represents observed effect estimates in each study.
<code>cov</code>	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 an 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

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

## Author(s)

Han Chen

## References

Chen H, Manning AK, Dupuis J. A method of moments estimator for random effect multivariate meta-analysis. *Biometrics* (Epub May 2, 2012)

## See Also

[mvtmeta\\_re](#)

**Examples**

```

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)
fe

```

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mvtmeta\_re

*Random effects multivariate meta-analysis.*


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**Description**

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

**Usage**

```
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.

**Details**

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**

Chen H, Manning AK, Dupuis J. A method of moments estimator for random effect multivariate meta-analysis. *Biometrics* (Epub May 2, 2012)

**See Also**

[mvtmeta\\_fe](#)

**Examples**

```
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))  
re <- mvtmeta_re(y, cov)  
re
```

# Index

## \*Topic **methods**

mvtmeta-package, 1

mvtmeta\_fe, 3

mvtmeta\_re, 4

## \*Topic **models**

mvtmeta-package, 1

mvtmeta\_fe, 3

mvtmeta\_re, 4

## \*Topic **multivariate**

mvtmeta-package, 1

mvtmeta\_fe, 3

mvtmeta\_re, 4

mvtmeta (mvtmeta-package), 1

mvtmeta-package, 1

mvtmeta\_fe, 3, 5

mvtmeta\_re, 3, 4