Mixed-effects Multivariate Meta-analysis

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May 14, 2017

```
library(metaSEM)

m1 <- read.csv("trialrun2.csv")

RE <- Diag(c("0.01*Tau2_1_1", "0.01*Tau2_2_2", "0.01*Tau2_3_3",
             "0.01*Tau2_4_4", "0.01*Tau2_5_5", "0.01*Tau2_6_6"))

## Starting values for the regression coefficients
coef.constraints <- paste0("0*Slope_", 1:6, "_1")

m2 <- meta(y=cbind(z_d, z_a, z_s, z_o, z_f, z_w),
           v=cbind(Var_d, cov.d.a, cov.d.s, cov.d.o, cov.d.f,
                   cov.d.w, Var_a, cov.a.s, cov.a.o, cov.a.f,
                   cov.a.w, Var_s, cov.s.o, cov.s.f, cov.s.w,
                   Var_o, cov.o.f, cov.o.w, Var_f, cov.f.w, Var_w),
           data=m1, RE.constraints=RE, x=P.f,
           coef.constraints = coef.constraints)
summary(m2)
```

```
##
## Call:
## meta(y = cbind(z_d, z_a, z_s, z_o, z_f, z_w), v = cbind(Var_d,
##     cov.d.a, cov.d.s, cov.d.o, cov.d.f, cov.d.w, Var_a, cov.a.s,
##     cov.a.o, cov.a.f, cov.a.w, Var_s, cov.s.o, cov.s.f, cov.s.w,
##     Var_o, cov.o.f, cov.o.w, Var_f, cov.f.w, Var_w), x = P.f,
##     data = m1, coef.constraints = coef.constraints, RE.constraints = RE)
##
## 95% confidence intervals: z statistic approximation
## Coefficients:
##               Estimate   Std.Error      lbound      ubound z value
## Intercept1  3.2533e-01  7.6011e-02  1.7636e-01  4.7431e-01  4.2801
## Intercept2  3.4999e-01  8.7790e-02  1.7793e-01  5.2206e-01  3.9867
## Intercept3  5.4958e-01  7.1211e-02  4.1001e-01  6.8916e-01  7.7177
## Intercept4  7.8271e-01  1.9781e-01  3.9502e-01  1.1704e+00  3.9569
## Intercept5  4.9200e-01  6.9949e-01 -8.7898e-01  1.8630e+00  0.7034
## Intercept6  8.7213e-01  2.1622e-01  4.4836e-01  1.2959e+00  4.0336
## Slope_1_1  -8.4043e-02  1.1312e-01 -3.0575e-01  1.3766e-01 -0.7430
## Slope_2_1  -3.8938e-02  1.2948e-01 -2.9272e-01  2.1484e-01 -0.3007
## Slope_3_1  -1.9609e-01  1.1567e-01 -4.2280e-01  3.0615e-02 -1.6953
## Slope_4_1  -6.8489e-01  3.1330e-01 -1.2989e+00 -7.0844e-02 -2.1861
## Slope_5_1  -1.7145e-01  1.1342e+00 -2.3944e+00  2.0515e+00 -0.1512
## Slope_6_1  -7.0806e-01  3.3686e-01 -1.3683e+00 -4.7833e-02 -2.1020
## Tau2_1_1    3.3989e-03  2.2467e-03 -1.0045e-03  7.8023e-03  1.5129
## Tau2_2_2    8.1495e-03  3.1347e-03  2.0056e-03  1.4293e-02  2.5998
## Tau2_3_3    1.0000e-10  3.7918e-03 -7.4319e-03  7.4319e-03  0.0000
## Tau2_4_4    1.4063e-02  6.9320e-03  4.7613e-04  2.7649e-02  2.0287
## Tau2_5_5    5.1883e-02  2.7333e-02 -1.6889e-03  1.0545e-01  1.8982
```

```
## Tau2_6_6    3.9477e-02  1.4120e-02  1.1802e-02  6.7152e-02  2.7958
##             Pr(>|z|)
## Intercept1 1.868e-05 ***
## Intercept2 6.700e-05 ***
## Intercept3 1.177e-14 ***
## Intercept4 7.592e-05 ***
## Intercept5  0.481826
## Intercept6 5.492e-05 ***
## Slope_1_1   0.457499
## Slope_2_1   0.763624
## Slope_3_1   0.090021 .
## Slope_4_1   0.028809 *
## Slope_5_1   0.879840
## Slope_6_1   0.035557 *
## Tau2_1_1    0.130313
## Tau2_2_2    0.009329 **
## Tau2_3_3    1.000000
## Tau2_4_4    0.042494 *
## Tau2_5_5    0.057673 .
## Tau2_6_6    0.005177 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 617.9635
## Degrees of freedom of the Q statistic: 125
## P value of the Q statistic: 0
##
## Explained variances (R2):
##                                y1         y2         y3         y4
## Tau2 (no predictor)    1.0714e-01 1.0826e-01 1.1232e-01 1.0739e-01
## Tau2 (with predictors) 3.3989e-03 8.1495e-03 1.0000e-10 1.4063e-02
## R2                     9.6828e-01 9.2472e-01 1.0000e+00 8.6905e-01
##                                y5     y6
## Tau2 (no predictor)    1.0945e-01 0.1246
## Tau2 (with predictors) 5.1883e-02 0.0395
## R2                     5.2596e-01 0.6833
##
## Number of studies (or clusters): 63
## Number of observed statistics: 131
## Number of estimated parameters: 18
## Degrees of freedom: 113
## -2 log likelihood: -152.1301
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```
sessionInfo()
```

```
## R version 3.4.0 (2017-04-21)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 10586)
##
## Matrix products: default
##
## locale:
## [1] LC_COLLATE=English_United States.1252
```

```
## [2] LC_CTYPE=English_United States.1252
## [3] LC_MONETARY=English_United States.1252
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] metaSEM_0.9.13-2 OpenMx_2.7.10
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.10    mvtnorm_1.0-6   lattice_0.20-35 digest_0.6.12
##  [5] rprojroot_1.2   MASS_7.3-47     grid_3.4.0      backports_1.0.5
##  [9] magrittr_1.5    ellipse_0.3-8   evaluate_0.10   stringi_1.1.5
## [13] Matrix_1.2-9    rmarkdown_1.5   tools_3.4.0     stringr_1.2.0
## [17] yaml_2.1.14     parallel_3.4.0  compiler_3.4.0  htmltools_0.3.5
## [21] knitr_1.15.1
```