```r
## data

library(dplyr)
library(metaSEM)

misdat <- read.csv("misdat_example.csv")

# FIML approach 1 ----------------------------------------------------------

# subset data for fiml
data_fiml <- misdat %>% dplyr::select(smd,v,V1)

# Create RAM formualtion
## A
  A1 <- matrix(c(
    0,0,1,0,
    0,0,0,1,
    0,0,0,"0*b1",
    0,0,0,0), byrow=TRUE, ncol=4)

  dimnames(A1) <- list(c("smd","V1","delta","eta1"),
                       c("smd","V1","delta", "eta1"))
  A1 <- as.mxMatrix(A1)

## S
  S1 <- mxMatrix("Symm", nrow=4, ncol=4, values=0, byrow=TRUE,
                 free=c(FALSE,
                        FALSE, FALSE,
                        FALSE, FALSE, TRUE,
                        FALSE, FALSE, FALSE, TRUE),
                 ## Mike: definition variable is represented by "data.v" in OpenMx.
                 labels=c("data.v",
                          NA, NA,
                          NA, NA, "Tau2",
                          NA, NA, NA, "VarV1"),
                 ## Mike: Estimated Tau2 is negative. lbound is required to make it stay positive.
                 lbound=c(NA,
                          NA, NA,
                          NA, NA, 1e-10,
                          NA, NA, NA, NA),
                 name="S1")

## Create an M matrix for the means

  M1 <- matrix(c(0,0,"0*b0","0*V1"), nrow=1)
  dimnames(M1)[[2]] <- c("smd","V1","delta", "eta1")
  M1 <- as.mxMatrix(M1)

## Create an F matrix to selecting the observed variables
  F1 <- create.Fmatrix(c(1,1,0,0), name="F", as.mxMatrix=FALSE)
  dimnames(F1) <- list(c("smd","V1"), c("smd","V1","delta", "eta1"))
  F1 <- as.mxMatrix(F1)
```

```r
# Fit a model
  mxmodel <- mxModel("FIML", mxData(data_fiml, type="raw"),
                     A1, S1, F1, M1,
                     mxExpectationRAM("A1","S1","F1","M1", dimnames=c("smd","V1","delta", "eta1")),
                     mxFitFunctionML())

  fit <- mxRun(mxmodel, silent = TRUE)

# Result
sum<-summary(fit)
sum$parameters
```

```
##    name matrix   row   col     Estimate  Std.Error lbound ubound lboundMet
## 1    b1     A1 delta  eta1 0.1886426608 0.02984619     NA     NA     FALSE
## 2  Tau2     S1     3     3 0.0000000001 0.01262215  1e-10     NA      TRUE
## 3 VarV1     S1     4     4 1.0350056145 0.20636430     NA     NA     FALSE
## 4    b0     M1     1 delta 0.0516094706 0.03416749     NA     NA     FALSE
## 5    V1     M1     1  eta1 0.2149168972 0.14035364     NA     NA     FALSE
##   uboundMet
## 1     FALSE
## 2     FALSE
## 3     FALSE
## 4     FALSE
## 5     FALSE
```

```r
# FIML approach 2 ------------------------------------------------------------

# Fit a model
fit_fiml <- metaFIML(y = smd, v = v, x = V1, data = misdat)

# Result
sum_fiml <- summary(fit_fiml)

round(sum_fiml$coefficients,3)
```

```
##            Estimate Std.Error lbound ubound z value Pr(>|z|)
## Tau2_1_1      0.000     0.013 -0.025  0.025   0.000    1.000
## CovX1_X1      1.035     0.206  0.631  1.439   5.015    0.000
## Slope1_1      0.189     0.030  0.130  0.247   6.320    0.000
## Intercept1    0.052     0.034 -0.015  0.119   1.510    0.131
## MeanX1        0.215     0.140 -0.060  0.490   1.531    0.126
```