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# LME library examples
library(magrittr)
library(data.table)
library(lme4)

## Loading required package: Matrix

# import test pseudo-panel statistics
dt_eff <- fread("output/rentsbi.csv")

# transform data accordingly
dt_eff[, variable_num := 0][variable == "prop_ren_w", variable_num := 1][variable == "prop_ren_k", variable_num := 2]
dt_mixed <- dt_eff[, list(years_bi, variable_num, value)]
setnames(dt_mixed,
  old = c("years_bi", "variable_num", "value"),
  new = c("year", "class", "rents")
)
dt_mixed$Covariate1 <- rbinom(n = nrow(dt_mixed), size = 10, prob = 0.2)

## estimate random correlated effects (Mixed Models)

# only effects, no covariates
fm1 <- lmer(rents ~ year + (year | class), data = dt_mixed)

## boundary (singular) fit: see help('isSingular')

fm1 %>%
  summary() %>%
  print()

## Linear mixed model fit by REML ['lmerMod']
## Formula: rents ~ year + (year | class)
## Data: dt_mixed
##
## REML criterion at convergence: -64.4
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.8110 -0.5549 -0.1321  0.4860  1.8593
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   class    (Intercept) 3.404e-05 0.005834
##   year      year        5.263e-05 0.007255 -1.00
## Residual                    1.142e-04 0.010687
## Number of obs: 14, groups: class, 2
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept) -0.004262   0.007603  -0.561
## year         0.011465   0.005325   2.153
##
## Correlation of Fixed Effects:
##      (Intr)
## year -0.724

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## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see help('isSingular')

# effects + one covariate/regressor
fm2 <- lmer(rents ~ year + Covariate1 + (year | class), data = dt_mixed)

## boundary (singular) fit: see help('isSingular')

fm2 %>%
  summary() %>%
  print()

## Linear mixed model fit by REML ['lmerMod']
## Formula: rents ~ year + Covariate1 + (year | class)
## Data: dt_mixed
##
## REML criterion at convergence: -54.5
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.54225 -0.55219 -0.07903  0.39856  1.79346
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   class    (Intercept)  0.0000000  0.000000
##   year      year          0.0000408  0.006388   NaN
##   Residual                    0.0001213  0.011015
## Number of obs: 14, groups:  class, 2
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept) -0.012805   0.012373  -1.035
## year         0.012496   0.004916   2.542
## Covariate1   0.002062   0.002529   0.815
##
## Correlation of Fixed Effects:
##              (Intr) year
## year         -0.360
## Covariate1 -0.847  0.257
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see help('isSingular')

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