

Linear models for pH and maybe more

Sasha D. Hafner

Nov 2020

```
dd <- subset(ds, pmid %in% pmid.cal2)

m1 <- lm(e.rel.72 ~ app.mthd + man.source + man.dm + man.ph + air.temp.24 + wind.2m.24, data = dd)
summary(m1)

##
## Call:
## lm(formula = e.rel.72 ~ app.mthd + man.source + man.dm + man.ph +
##     air.temp.24 + wind.2m.24, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.41777 -0.08918 -0.00289  0.07154  0.55256
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.668267   0.163255  -4.093 5.20e-05 ***
## app.mthdbc     0.323464   0.027187  11.898 < 2e-16 ***
## app.mthdts    -0.070395   0.028491  -2.471  0.0139 *
## app.mthdos    -0.162550   0.027729  -5.862 9.93e-09 ***
## man.sourcepig -0.097577   0.024768  -3.940 9.71e-05 ***
## man.dm         0.032499   0.005318   6.111 2.45e-09 ***
## man.ph         0.090656   0.020291   4.468 1.04e-05 ***
## air.temp.24    0.005311   0.001876   2.830  0.0049 **
## wind.2m.24     0.005509   0.004713   1.169  0.2432
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1511 on 380 degrees of freedom
## (63 observations deleted due to missingness)
## Multiple R-squared:  0.6468, Adjusted R-squared:  0.6394
## F-statistic: 86.99 on 8 and 380 DF, p-value: < 2.2e-16

m2 <- update(m1, ~ . - man.ph)
summary(m2)

##
## Call:
## lm(formula = e.rel.72 ~ app.mthd + man.source + man.dm + air.temp.24 +
##     wind.2m.24, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -0.41050 -0.09239 -0.00356 0.08351 0.58918
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.029134  0.049002   0.595 0.552498
## app.mthdbc   0.335812  0.027711  12.118 < 2e-16 ***
## app.mthdts  -0.037085  0.028174  -1.316 0.188864
## app.mthdos  -0.152013  0.028307  -5.370 1.37e-07 ***
## man.sourcepig -0.076992  0.024933  -3.088 0.002163 **
## man.dm       0.024291  0.005113   4.751 2.88e-06 ***
## air.temp.24  0.006350  0.001908   3.329 0.000957 ***
## wind.2m.24   0.004240  0.004820   0.879 0.379690
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1549 on 381 degrees of freedom
## (63 observations deleted due to missingness)
## Multiple R-squared:  0.6283, Adjusted R-squared:  0.6214
## F-statistic: 91.99 on 7 and 381 DF, p-value: < 2.2e-16

m3 <- update(m2, ~ . - man.dm)
summary(m3)

##
## Call:
## lm(formula = e.rel.72 ~ app.mthd + man.source + air.temp.24 +
##     wind.2m.24, data = dd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.45761 -0.09108 -0.00332  0.08872  0.59679
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.154851  0.042390   3.653 0.000295 ***
## app.mthdbc   0.400791  0.024771  16.180 < 2e-16 ***
## app.mthdts   0.024370  0.025725   0.947 0.344082
## app.mthdos  -0.093117  0.026157  -3.560 0.000418 ***
## man.sourcepig -0.132302  0.022662  -5.838 1.13e-08 ***
## air.temp.24  0.006221  0.001961   3.173 0.001629 **
## wind.2m.24   0.003360  0.004951   0.679 0.497720
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1592 on 382 degrees of freedom
## (63 observations deleted due to missingness)
## Multiple R-squared:  0.6062, Adjusted R-squared:  0.6001
## F-statistic: 98.03 on 6 and 382 DF, p-value: < 2.2e-16
```