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####################
# Anova for full model fitting #
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# Definition function
anova_alt = function (object, reg_collapse=TRUE,...)
{
  if (length(list(object, ...)) > 1L)
    return(anova.lmlist(object, ...))
  if (!inherits(object, "lm"))
    warning("calling anova.lm(<fake-lm-object>) ...")
  w <- object$weights
  ssr <- sum(if (is.null(w)) object$residuals^2 else w * object$residuals^2)
  mss <- sum(if (is.null(w)) object$fitted.values^2 else w *
              object$fitted.values^2)
  if (ssr < 1e-10 * mss)
    warning("ANOVA F-tests on an essentially perfect fit are unreliable")
  dfr <- df.residual(object)
  p <- object$rank
  if (p > 0L) {
    p1 <- 1L:p
    comp <- object$effects[p1]
    asgn <- object$assign[stats:::qr.lm(object)$pivot][p1]
    nmeffects <- c("(Intercept)", attr(object$terms, "term.labels"))
    tlabels <- nmeffects[1 + unique(asgn)]
    ss <- c(vapply(split(comp^2, asgn), sum, 1), ssr)
    df <- c(lengths(split(asgn, asgn)), dfr)
    if(reg_collapse){
      if(attr(object$terms, "intercept")){
        collapse_p<-2:(length(ss)-1)
        ss<-c(ss[1],sum(ss[collapse_p]),ss[length(ss)])
        df<-c(df[1],sum(df[collapse_p]),df[length(df)])
        tlabels<-c(tlabels[1],"Source")
      } else{
        collapse_p<-1:(length(ss)-1)
        ss<-c(sum(ss[collapse_p]),ss[length(ss)])
        df<-c(df[1],sum(df[collapse_p]),df[length(df)])
        tlabels<-c("Regression")
      }
    }
  }else {
    ss <- ssr
    df <- dfr
    tlabels <- character()
    if(reg_collapse){
      collapse_p<-1:(length(ss)-1)
      ss<-c(sum(ss[collapse_p]),ss[length(ss)])
      df<-c(df[1],sum(df[collapse_p]),df[length(df)])
    }
  }

  ms <- ss/df
  f <- ms/(ssr/dfr)
  P <- pf(f, df, dfr, lower.tail = FALSE)
  table <- data.frame(df, ss, ms, f, P)
  table <- rbind(table,
                 colSums(table))
  if (attr(object$terms, "intercept")){
    table$ss[nrow(table)]<- table$ss[nrow(table)] - table$ss[1]
  }
  table$ms[nrow(table)]<-table$ss[nrow(table)]/table$df[nrow(table)]
  table[length(P):(length(P)+1), 4:5] <- NA
  dimnames(table) <- list(c(tlabels, "Error","Total"),
                          c("Df","SS", "MS", "F",
                            "P"))
  if (attr(object$terms, "intercept")){
    table <- table[-1, ]
    table$MS[nrow(table)]<-table$MS[nrow(table)]*
(table$Df[nrow(table)])/(table$Df[nrow(table)]-1)
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    table$Df[nrow(table)]<-table$Df[nrow(table)]-1
  }
  structure(table, heading = c("Analysis of Variance Table\n"),
            class = c("anova", "data.frame"))
}

install.packages("Hmisc")
library("Hmisc")
setwd("/Users/huangweiting/coding/INTRODUCTION TO SCIENTIFIC COMPUTING SOFTWARE
/W10_ClassData")
getwd()
data1<-read.csv("HW_Database.csv")
Ex1 <- data.frame
(PM25=c(data1$PM25),NO2=c(data1$NO2),Temperature=c(data1$Temperature),RH=c(data1$RH))
rcorr(as.matrix(Ex1),type=c("pearson"))

Ex1_lm<-lm(NO2 ~ PM25+Temperature+RH, data=Ex1)
summary(Ex1_lm)

anova_alt(Ex1_lm)
anova(lm(NO2~Temperature,data=data1))
anova(lm(NO2~PM25,data=data1))
anova(lm(NO2~RH,data=data1))
```