

UPDATING FORMULAS

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The update function

- ▶ Extremely useful for making quick changes to objects.
- ▶ The `update` function is an S3 method found in the `stats` package.
- ▶ Other `update` methods are found in other packages.

```
# Example
data("diamonds", package = "ggplot2")
fit <- lm(price ~ cut + color + carat, data = diamonds)
fit

##
## Call:
## lm(formula = price ~ cut + color + carat, data = diamonds)
##
## Coefficients:
## (Intercept)          cut.L          cut.Q          cut.C          cut^4
##   -3149.82       1243.35       -531.75        372.06        76.15
##   color.L       color.Q       color.C       color^4       color^5
##   -1579.17       -732.85       -107.41         81.63       -138.64
##   color^6         carat
##   -161.09       8183.74
```

Example: update formula in the linear model

```
# the dot means "keep all of this side"
# add clarity to the rhs
update(fit, formula = . ~ . + clarity)

##
## Call:
## lm(formula = price ~ cut + color + carat + clarity, data = diamonds)
##
## Coefficients:
## (Intercept)          cut.L          cut.Q          cut.C          cut^4
##   -3710.603         698.907        -327.686         180.565         -1.207
##   color.L          color.Q          color.C          color^4          color^5
##  -1910.288        -627.954        -171.960          21.678        -85.943
##   color^6          carat          clarity.L          clarity.Q          clarity.C
##    -49.986         8886.129         4217.535        -1832.406          923.273
## clarity^4          clarity^5          clarity^6          clarity^7
##   -361.995          216.616           2.105          110.340
```

Example: update formula in the linear model

```
# the dot means "keep all of this side"
# remove cut from the rhs
update(fit, formula = . ~ . - cut)

##
## Call:
## lm(formula = price ~ color + carat, data = diamonds)
##
## Coefficients:
## (Intercept)      color.L      color.Q      color.C      color^4
##    -2702.23    -1572.20    -741.14    -122.70         78.77
##      color^5      color^6          carat
##    -144.74    -180.75    8066.62
```

Example: update data set in the linear model

```
# remove the ordering from diamonds$cut
update(fit,
      data = dplyr::mutate(diamonds, cut = factor(cut, ordered = FALSE)))

##
## Call:
## lm(formula = price ~ cut + color + carat, data = dplyr::mutate(diamonds,
##      cut = factor(cut, ordered = FALSE)))
##
## Coefficients:
## (Intercept)      cutGood  cutVery Good    cutPremium    cutIdeal
##    -4328.97     1126.98     1518.00     1442.73     1808.04
##   color.L    color.Q    color.C    color^4    color^5
##  -1579.17    -732.85   -107.41      81.63    -138.64
##   color^6      carat
##   -161.09     8183.74
```

Example: update multiple parts of an object

```
update(fit,  
  formula = . ~ . + clarity,  
  data = dplyr::mutate(diamonds, cut = factor(cut, ordered = FALSE)))  
  
##  
## Call:  
## lm(formula = price ~ cut + color + carat + clarity, data = dplyr::mutate(diamonds,  
##   cut = factor(cut, ordered = FALSE)))  
##  
## Coefficients:  
## (Intercept)      cutGood  cutVery Good    cutPremium    cutIdeal  
##   -4385.030     655.767      848.717      869.396      998.254  
##   color.L      color.Q      color.C      color^4      color^5  
##  -1910.288    -627.954    -171.960       21.678     -85.943  
##   color^6      carat      clarity.L    clarity.Q    clarity.C  
##   -49.986     8886.129     4217.535    -1832.406     923.273  
##   clarity^4    clarity^5    clarity^6    clarity^7  
##   -361.995     216.616        2.105       110.340
```

Example: Discretization of carat

```
# Carat is on the rhs as a continuous and categorical variable
update(fit,
  formula = . ~ . + cut(carat, breaks = c(0, 0.5, 1.0, 2.0, 5.0))) %>%
magrittr::extract("call")

## $call
## lm(formula = price ~ cut + color + carat + cut(carat, breaks = c(0,
##      0.5, 1, 2, 5)), data = diamonds)

# cut and color are missing from the rhs
update(fit,
  formula = . ~ cut(carat, breaks = c(0, 0.5, 1.0, 2.0, 5.0))) %>%
magrittr::extract("call")

## $call
## lm(formula = price ~ cut(carat, breaks = c(0, 0.5, 1, 2, 5)),
##      data = diamonds)
```

Example: Discretization of carat

```
# correct specification
fit <- update(fit,
              formula = . ~ . - carat +
                        cut(carat, breaks = c(0, 0.5, 1.0, 2.0, 5.0)))
fit %>% magrittr::extract("call")

## $call
## lm(formula = price ~ cut + color + cut(carat, breaks = c(0, 0.5,
##      1, 2, 5)), data = diamonds)
```


Example: Change the arguments passed to cut

```
# this does not work. breaks needs to be passed to cut
update(fit, breaks = c(0, 2, 5))

## Warning in lm.fit(x, y, offset = offset, singular.ok = singular.ok,
...): extra argument 'breaks' is disregarded.

##
## Call:
## lm(formula = price ~ cut + color + cut(carat, breaks = c(0, 0.5,
##      1, 2, 5)), data = diamonds, breaks = c(0, 2, 5))
##
## Coefficients:
##                                (Intercept)
##                                483.250
##                                cut.L
##                                502.312
##                                cut.Q
##                               -318.269
##                                cut.C
##                                159.146
##                                cut^4
##                                2.116
##                                color.L
##                               -1044.815
##                                color.Q
```

Want: Update the breaks in the formula passed to `lm`

```
# Define a function new_breaks to update the breaks argument in cut  
# within a formula.
```

```
new_breaks <- function(form, brks) {  
  rr <- function(x, brks) {  
    if(is.call(x) && grepl("cut", deparse(x[[1]]))) {  
      x$breaks <- brks  
      x  
    } else if (is.recursive(x)) {  
      as.call(lapply(as.list(x), rr, brks))  
    } else {  
      x  
    }  
  }  
  
  z <- lapply(as.list(form), rr, brks)  
  z <- eval(as.call(z))  
  environment(z) <- environment(form)  
  z  
}
```

Old, Update, and Updated calls

```
# original call
fit$call

## lm(formula = price ~ cut + color + cut(carat, breaks = c(0, 0.5,
##      1, 2, 5)), data = diamonds)

# update the call
fit <- update(fit,
              formula = new_breaks(formula(fit), brks = c(0, 2.0, 5.0)))

# view updated call
fit$call

## lm(formula = price ~ cut + color + cut(carat, breaks = c(0, 2,
##      5)), data = diamonds)
```

New Regression Coefficients

```
matrix(fit$coefficients, ncol = 1,  
       dimnames = list(names(coef(fit)), "coef"))  
  
##               coef  
## (Intercept) 3610.50190  
## cut.L      -50.99444  
## cut.Q     -366.06146  
## cut.C     -345.65893  
## cut^4     -187.65810  
## color.L    782.85277  
## color.Q   -326.93072  
## color.C   -224.45049  
## color^4    176.15135  
## color^5   -201.19901  
## color^6     43.98655  
## cut(carat, breaks = c(0, 2, 5))(2,5] 11062.59853
```

Wrap Up

- ▶ Functions like `new_breaks` are very useful when running automated tasks, perhaps searching for an ‘optimum’ binning of `carat`?
- ▶ A great exercise for dealing with
 - ▶ Non-standard evaluation (see “Advanced R” by Wickham <http://adv-r.had.co.nz/Computing-on-the-language.html>)
 - ▶ Recursion
 - ▶ Working with `environments`