Model Fitting I

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Slide Code

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --

## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.0.6     v dplyr   1.0.4
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(readxl)

CoffeeChain <- read_excel("CoffeeChain.xlsx")

m1 <- lm(Profit ~ Market * MarketSize + Market * COGS, data = CoffeeChain)
summary(m1)
```

```
##
## Call:
## lm(formula = Profit ~ Market * MarketSize + Market * COGS, data = CoffeeChain)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -771.87  -20.64    1.65   21.73  721.75
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      -4.26570    4.79625  -0.889  0.37385
## MarketEast                       30.68239    7.83224   3.917 9.09e-05 ***
## MarketSouth                      17.89732   11.51494   1.554  0.12020
## MarketWest                       48.99987    9.08179   5.395 7.21e-08 ***
## MarketSizeSmall Market          -14.88927    4.84672  -3.072  0.00214 **
## COGS                              0.96574    0.03719  25.964  < 2e-16 ***
```

```
## MarketEast:MarketSizeSmall Market   -8.20585    8.25011  -0.995  0.31997
## MarketSouth:MarketSizeSmall Market -13.73362    9.74931  -1.409  0.15900
## MarketWest:MarketSizeSmall Market  -21.48502    8.15131  -2.636  0.00843 **
## MarketEast:COGS                     -0.39202    0.05883  -6.664 3.02e-11 ***
## MarketSouth:COGS                    -0.10598    0.09318  -1.137  0.25544
## MarketWest:COGS                     -0.55016    0.05187 -10.606  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 87.96 on 4236 degrees of freedom
## Multiple R-squared:  0.254,  Adjusted R-squared:  0.2521
## F-statistic: 131.1 on 11 and 4236 DF,  p-value: < 2.2e-16
```

```
library(emmeans)
emmeans(m1, ~ Market)
```

```
## NOTE: Results may be misleading due to involvement in interactions

##  Market  emmean   SE   df lower.CL upper.CL
##  Central   69.8 2.40 4236     65.1     74.5
##  East      63.3 3.06 4236     57.3     69.3
##  South     71.9 4.01 4236     64.1     79.8
##  West      61.6 3.15 4236     55.5     67.8
##
## Results are averaged over the levels of: MarketSize
## Confidence level used: 0.95
```

```
emmeans(m1, ~ MarketSize | Market)
```

```
## Market = Central:
##  MarketSize   emmean   SE   df lower.CL upper.CL
##  Major Market   77.3 3.35 4236     70.7     83.8
##  Small Market   62.4 3.47 4236     55.6     69.2
##
## Market = East:
##  MarketSize   emmean   SE   df lower.CL upper.CL
##  Major Market   74.9 3.90 4236     67.2     82.5
##  Small Market   51.8 5.08 4236     41.8     61.7
##
## Market = South:
##  MarketSize   emmean   SE   df lower.CL upper.CL
##  Major Market   86.2 6.83 4236     72.8     99.6
##  Small Market   57.6 4.61 4236     48.6     66.6
##
## Market = West:
##  MarketSize   emmean   SE   df lower.CL upper.CL
##  Major Market   79.8 5.82 4236     68.4     91.2
##  Small Market   43.4 2.72 4236     38.1     48.8
##
## Confidence level used: 0.95
```

```
emmeans(m1, ~ COGS | Market)
```

```
## Market = Central:
##  COGS emmean   SE   df lower.CL upper.CL
##  84.4   69.8 2.40 4236     65.1     74.5
##
## Market = East:
##  COGS emmean   SE   df lower.CL upper.CL
##  84.4   63.3 3.06 4236     57.3     69.3
##
## Market = South:
##  COGS emmean   SE   df lower.CL upper.CL
##  84.4   71.9 4.01 4236     64.1     79.8
##
## Market = West:
##  COGS emmean   SE   df lower.CL upper.CL
##  84.4   61.6 3.15 4236     55.5     67.8
##
## Results are averaged over the levels of: MarketSize
## Confidence level used: 0.95
```