Lecture 12
Segment 2

Moderation analysis in R

Goal

- Write a script in R to test for moderation
  - Two regression analyses
    - Outcome = Predictor + Moderator
    - Outcome = Predictor + Moderator + Product

Goal

- Write a script in R to test for moderation
  - Two regression analyses
    - lm(Y ~ X + Z)
    - lm(Y ~ X + Z + (X*Z))

Example

- Fictional data
  - Outcome (Y)
    - Happiness
  - Predictors (X, Z)
    - Extraversion (X)
    - Socio-Economic Status (SES) (Z)

Moderation example

- Data are available in the following file:
  - STATS1.EX.06.txt

Write a script

- First line(s) of code should be comments

```
# Statistics One, Lecture 12, example script
# Moderation analysis
# X is extraversion
# Y is happiness
# Z is SES
```

Write a script

- Read data into a dataframe called “mod”

```
mod <- read.table(“STATS1.EX.06.txt”, header = T)
```

Write a script

- Conduct two regression analyses

```
no.mod.model = lm(mod$happy ~ mod$extra + mod$ses)
  summary(no.mod.model)

mod.model =
    lm(mod$happy ~ mod$extra + mod$ses + mod$mod)
  summary(mod.model)
```

Write a script

- Compare models

  anova(no.mod.model, mod.model)

No moderation

```
> # Moderation analysis
> no.mod.model = lm(mod$happy ~ mod$extra + mod$ses)
> summary(no.mod.model)

Call:
lm(formula = mod$happy ~ mod$extra + mod$ses)

Residuals:
    Min      1Q  Median      3Q     Max
-2.2313 -0.2215 -0.1626  0.8178  1.9257

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 3.035e+00  2.725e-01  11.139   <2e-16 ***
mod$extra   3.924e-02  7.354e-02   0.534    0.594
mod$ses     3.664e-16  9.936e-02   0.000    1.000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9633 on 373 degrees of freedom
Multiple R-squared: 0.0007628,Adjusted R-squared: -0.004595
F-statistic: 0.1424 on 2 and 373 DF,  p-value: 0.8673
```

Moderation

```
>
> mod.model = lm(mod$happy ~ mod$extra + mod$ses + mod$mod)
> summary(mod.model)

Call:
lm(formula = mod$happy ~ mod$extra + mod$ses + mod$mod)

Residuals:
     Min       1Q   Median       3Q      Max
-2.33880 -0.42882 -0.08476  0.77762  2.05286

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   3.8799     0.3741  10.371  < 2e-16 ***
mod$extra    -0.1968     0.1027  -1.916  0.05612 .
mod$ses      -1.6897     0.5291  -3.194  0.00152 **
mod$mod       0.4720     0.1452   3.250  0.00126 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9512 on 372 degrees of freedom
Multiple R-squared: 0.02835,  Adjusted R-squared: 0.02052
F-statistic: 3.619 on 3 and 372 DF,  p-value: 0.01337
```

Compare models

```
>
> # Compare models
> anova(no.mod.model, mod.model)
Analysis of Variance Table

Model 1: mod$happy ~ mod$extra + mod$ses
Model 2: mod$happy ~ mod$extra + mod$ses + mod$mod
  Res.Df    RSS Df Sum of Sq      F   Pr(>F)
1    373 346.15
2    372 336.59  1    9.5582 10.564 0.001258 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Final script

```
# Statistics One, Lecture 12, example script
# Moderation analysis
# X: Extraversion
# Y: Happiness
# Z: SES

# Create object mod, which is a dataframe and contains the data for the moderation analysis
mod <- read.table("STATS1.EX.06.txt", header = T)
```

Final script

```
# Moderation analysis
no.mod.model = lm(mod$happy ~ mod$extra + mod$ses)
summary(no.mod.model)

mod.model = lm(mod$happy ~ mod$extra + mod$ses + mod$mod)
summary(mod.model)

# Compare models
anova(no.mod.model, mod.model)
```