HW15

107070008

```
library(seminr)
sec = read.csv("security_data_sem.csv")
```

Question 1) Composite Path Models using PLS-PM

a. Create a PLS path model using SEMinR, with all the following characteristics:

i. Measurement model - all constructs are measured as composites:**

- **1.Trust in website (TRUST): items TRST1 - TRST4**
- **2.Perceived security of website (SEC): items PSEC1 - PSEC4**
- **3.Reputation of website (REP): items PREP1 - PREP4**
- **4.Investment in website (INV): items PINV1 - PINV3**
- **5.Perception of privacy policies (POL): items PPSS1 - PPSS3**
- **6.Familiarity with website (FAML): item FAML1 (see the documentation of SEMinR for making single item constructs)**
- **7.Interaction between REP and POL (use orthogonalized product terms)**

```
#Measurement Model
sec_mm <- constructs(
  composite("TRUST", multi_items("TRST", 1:4)),
  composite("SEC", multi_items("PSEC", 1:4)),
  composite("REP", multi_items("PREP", 1:4)),
  composite("INV", multi_items("PINV", 1:3)),
  composite("POL", multi_items("PPSS", 1:3)),
  composite("FAML", multi_items("FAML", 1:1)),
  interaction_term(iv ="REP", moderator ="POL", method = orthogonal)
)
```

ii. Structural Model - paths between constructs as shown in this causal model: REP+INV+ POL+FAML+(REP*POL)-> SEC -> TRUST

```
#Structural Model
sec_sm <- relationships(
  paths(from = c("REP", "INV", "POL", "FAML", "REP*POL"), to = "SEC"),
  paths(from = "SEC", to = "TRUST")
)
```

b.Show us the following results in table or figure formats:

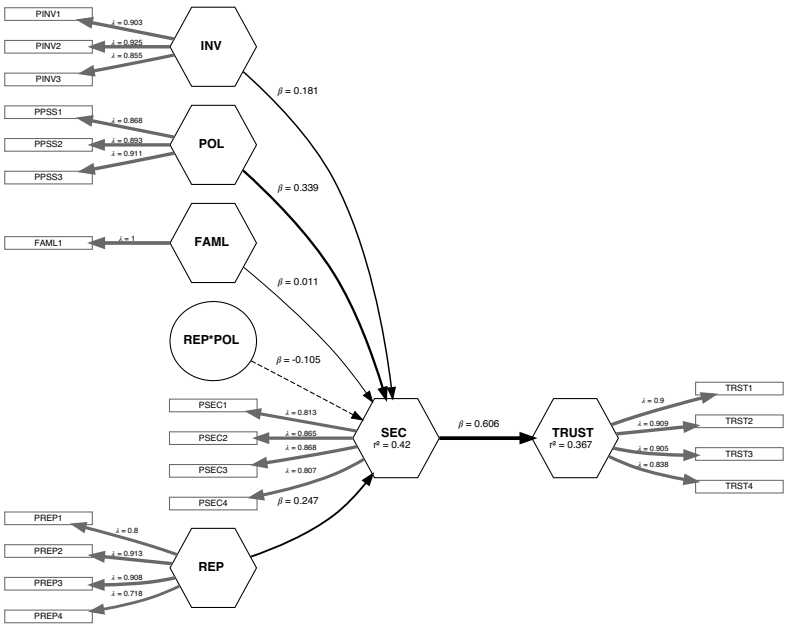
- **i.Plot a figure of the estimated model**

```
sec_pls <- estimate_pls(data = sec,
                        measurement_model = sec_mm,
                        structural_model = sec_sm)
```

```
## Generating the seminr model
```

```
## All 405 observations are valid.
```

```
plot(sec_pls)
```



- **ii.Weights and loadings of composites**

```
sec_report <- summary(sec_pls)
sec_report$weights
```

```
##               REP   INV   POL  FAML REP*POL   SEC TRUST
## TRST1       0.000 0.000 0.000 0.000   0.000 0.000 0.282
## TRST2       0.000 0.000 0.000 0.000   0.000 0.000 0.280
## TRST3       0.000 0.000 0.000 0.000   0.000 0.000 0.286
## TRST4       0.000 0.000 0.000 0.000   0.000 0.000 0.278
## PSEC1       0.000 0.000 0.000 0.000   0.000 0.277 0.000
## PSEC2       0.000 0.000 0.000 0.000   0.000 0.315 0.000
## PSEC3       0.000 0.000 0.000 0.000   0.000 0.307 0.000
```

```
## PSEC4       0.000 0.000 0.000 0.000   0.000 0.292 0.000
## PREP1       0.215 0.000 0.000 0.000   0.000 0.000 0.000
## PREP2       0.334 0.000 0.000 0.000   0.000 0.000 0.000
## PREP3       0.349 0.000 0.000 0.000   0.000 0.000 0.000
## PREP4       0.287 0.000 0.000 0.000   0.000 0.000 0.000
## PINV1       0.000 0.363 0.000 0.000   0.000 0.000 0.000
## PINV2       0.000 0.395 0.000 0.000   0.000 0.000 0.000
## PINV3       0.000 0.358 0.000 0.000   0.000 0.000 0.000
## PPSS1       0.000 0.000 0.360 0.000   0.000 0.000 0.000
## PPSS2       0.000 0.000 0.395 0.000   0.000 0.000 0.000
## PPSS3       0.000 0.000 0.367 0.000   0.000 0.000 0.000
## FAML1       0.000 0.000 0.000 1.000   0.000 0.000 0.000
## PREP1*PPSS1 0.000 0.000 0.000 0.000   0.239 0.000 0.000
## PREP1*PPSS2 0.000 0.000 0.000 0.000   0.031 0.000 0.000
## PREP1*PPSS3 0.000 0.000 0.000 0.000   0.021 0.000 0.000
## PREP2*PPSS1 0.000 0.000 0.000 0.000   0.046 0.000 0.000
## PREP2*PPSS2 0.000 0.000 0.000 0.000  -0.104 0.000 0.000
## PREP2*PPSS3 0.000 0.000 0.000 0.000  -0.228 0.000 0.000
## PREP3*PPSS1 0.000 0.000 0.000 0.000  -0.341 0.000 0.000
## PREP3*PPSS2 0.000 0.000 0.000 0.000   0.095 0.000 0.000
## PREP3*PPSS3 0.000 0.000 0.000 0.000   0.108 0.000 0.000
## PREP4*PPSS1 0.000 0.000 0.000 0.000   0.443 0.000 0.000
## PREP4*PPSS2 0.000 0.000 0.000 0.000   0.382 0.000 0.000
## PREP4*PPSS3 0.000 0.000 0.000 0.000   0.271 0.000 0.000
```

```
head(sec_report$loadings)
```

```
##       REP INV POL FAML REP*POL       SEC     TRUST
## TRST1   0   0   0    0       0 0.0000000 0.8997771
## TRST2   0   0   0    0       0 0.0000000 0.9092172
## TRST3   0   0   0    0       0 0.0000000 0.9045581
## TRST4   0   0   0    0       0 0.0000000 0.8381701
## PSEC1   0   0   0    0       0 0.8133463 0.0000000
## PSEC2   0   0   0    0       0 0.8652000 0.0000000
```

```
tail(sec_report$loadings)
```

```
##             REP INV POL FAML   REP*POL SEC TRUST
## PREP3*PPSS1   0   0   0    0 0.2356078   0     0
## PREP3*PPSS2   0   0   0    0 0.5546226   0     0
## PREP3*PPSS3   0   0   0    0 0.4656265   0     0
## PREP4*PPSS1   0   0   0    0 0.8995792   0     0
## PREP4*PPSS2   0   0   0    0 0.8361087   0     0
## PREP4*PPSS3   0   0   0    0 0.8589106   0     0
```

- **iii.Regression coefficients of paths between factors**

```
sec_report$path
```

```
##            SEC TRUST
## R^2      0.420 0.367
```

```
## AdjR^2   0.412 0.365
## REP      0.247     .
## INV      0.181     .
## POL      0.339     .
## FAML     0.011     .
## REP*POL -0.105     .
## SEC          . 0.606
```

- **iv.*Bootstrapped path coefficients: t-values, 95% CI**

```
boot_pls <- bootstrap_model(sec_pls, nboot= 1000, cores = 4, seed = NULL)
```

```
## Bootstrapping model using seminr...
```

```
## SEMinR Model successfully bootstrapped
```

```
boot_pls_report <- summary(boot_pls)
CI_2.5 <- boot_pls_report$bootstrapped_paths[, "2.5% CI"]
CI_97.5 <-  boot_pls_report$bootstrapped_paths[, "97.5% CI"]
tvalues <- boot_pls_report$bootstrapped_paths[, "T Stat."]
data.frame(tvalues, CI_2.5, CI_97.5)
```

```
##                      tvalues     CI_2.5   CI_97.5
## REP  ->  SEC      4.4973021  0.1345203 0.3445311
## INV  ->  SEC      3.1957230  0.0727202 0.2994997
## POL  ->  SEC      6.1651130  0.2325997 0.4424546
## FAML  ->  SEC     0.1730523 -0.1063159 0.1258441
## REP*POL  ->  SEC -0.8529795 -0.1969665 0.1857767
## SEC  ->  TRUST   16.7343746  0.5349829 0.6745461
```

Question 2) Common-Factor Models using CB-SEM

a. Create a common factor model using SEMinR, with the following characteristics:

i. Either respecify all the constructs as being reflective(), or use the as.reflective()

```
sec_cf_mm <- as.reflective(sec_mm)
```

ii. function to convert your earlier measurement model to being entirely reflective.

Use the same structural model as before (you can just reuse it again!)**

```
sec_cf_sm <- sec_sm
```

b. Show us the following results in table or figure formats

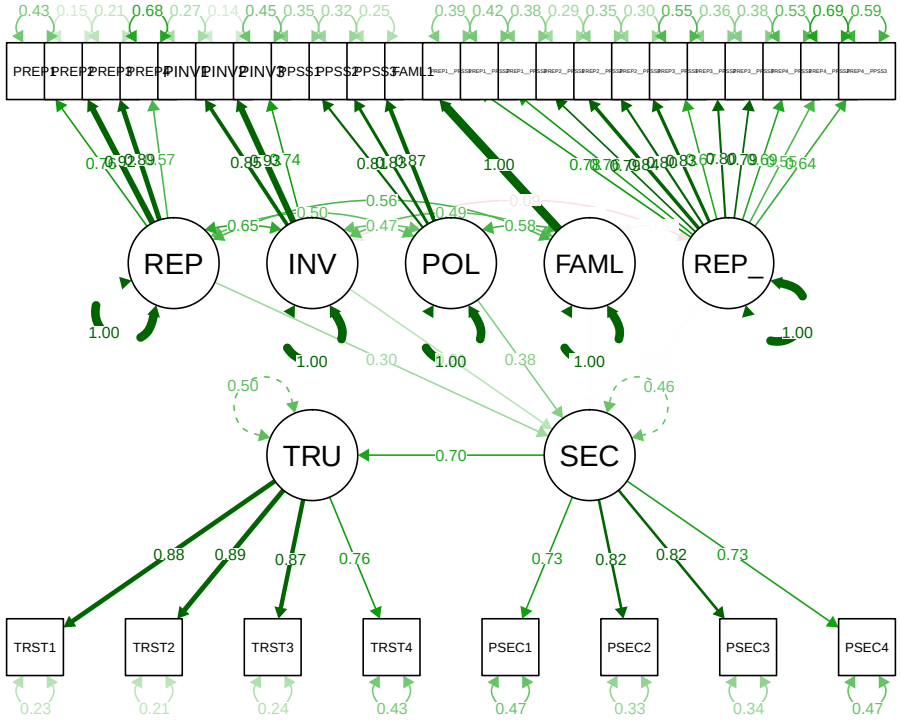
i. Plot a figure of the estimated model (it will look different from your PLS model)

```
sec_cf_pls <- estimate_cbsem(data = sec,
                         measurement_model = sec_cf_mm,
                         structural_model = sec_cf_sm)
```

```
## Generating the seminr model for CBSEM
```

```
library(semPlot)
plot(sec_cf_pls)
```

```
## Plotting of lavaan models using semPlot.
```




```
## NULL
```

ii. Loadings of composites

```
sec_cf_report <- summary(sec_cf_pls)
sec_cf_report$loadings
```

```
## $coefficients
##           TRUST       SEC       REP       INV       POL FAML
## TRST1 0.8800240        NA        NA        NA        NA   NA
## TRST2 0.8886342        NA        NA        NA        NA   NA
## TRST3 0.8690644        NA        NA        NA        NA   NA
## TRST4 0.7575988        NA        NA        NA        NA   NA
## PSEC1        NA 0.7308766        NA        NA        NA   NA
## PSEC2        NA 0.8173481        NA        NA        NA   NA
## PSEC3        NA 0.8151708        NA        NA        NA   NA
## PSEC4        NA 0.7260444        NA        NA        NA   NA
## PREP1        NA        NA 0.7551328        NA        NA   NA
## PREP2        NA        NA 0.9199208        NA        NA   NA
## PREP3        NA        NA 0.8871362        NA        NA   NA
## PREP4        NA        NA 0.5650059        NA        NA   NA
## PINV1        NA        NA        NA 0.8520004        NA   NA
## PINV2        NA        NA        NA 0.9257476        NA   NA
## PINV3        NA        NA        NA 0.7388750        NA   NA
## PPSS1        NA        NA        NA        NA 0.8051533   NA
## PPSS2        NA        NA        NA        NA 0.8272576   NA
## PPSS3        NA        NA        NA        NA 0.8674335   NA
## FAML1        NA        NA        NA        NA        NA    1
##
## $significance
##                             Std Estimate         SE      t-Value   2.5% CI
## TRUST -> TRST1                 0.8800240 0.02272091 0.000000e+00 0.8354919
## TRUST -> TRST2                 0.8886342 0.03330783 0.000000e+00 0.8233521
## TRUST -> TRST3                 0.8690644 0.03749444 0.000000e+00 0.7955767
## TRUST -> TRST4                 0.7575988 0.04846748 0.000000e+00 0.6626042
## SEC -> PSEC1                   0.7308766 0.03679205 0.000000e+00 0.6587655
## SEC -> PSEC2                   0.8173481 0.04480183 0.000000e+00 0.7295381
## SEC -> PSEC3                   0.8151708 0.03728082 0.000000e+00 0.7421017
## SEC -> PSEC4                   0.7260444 0.03811841 0.000000e+00 0.6513337
## REP -> PREP1                   0.7551328 0.04464916 0.000000e+00 0.6676220
## REP -> PREP2                   0.9199208 0.02635333 0.000000e+00 0.8682692
## REP -> PREP3                   0.8871362 0.04015103 0.000000e+00 0.8084416
## REP -> PREP4                   0.5650059 0.04585583 0.000000e+00 0.4751302
## INV -> PINV1                   0.8520004 0.04489927 0.000000e+00 0.7639994
## INV -> PINV2                   0.9257476 0.04556425 0.000000e+00 0.8364433
## INV -> PINV3                   0.7388750 0.04511601 0.000000e+00 0.6504492
## POL -> PPSS1                   0.8051533 0.04355300 0.000000e+00 0.7197910
## POL -> PPSS2                   0.8272576 0.02807169 0.000000e+00 0.7722381
## POL -> PPSS3                   0.8674335 0.03273664 0.000000e+00 0.8032708
## FAML -> FAML1                  1.0000000 0.00000000           NA 1.0000000
## REP_x_POL -> PREP1_x_PPSS1     0.7781584 0.05799871 0.000000e+00 0.6644831
## REP_x_POL -> PREP1_x_PPSS2     0.7597768 0.05931838 0.000000e+00 0.6435149
## REP_x_POL -> PREP1_x_PPSS3     0.7879106 0.05013554 0.000000e+00 0.6896467
## REP_x_POL -> PREP2_x_PPSS1     0.8447368 0.03649041 0.000000e+00 0.7732169
## REP_x_POL -> PREP2_x_PPSS2     0.8034561 0.03639411 0.000000e+00 0.7321250
## REP_x_POL -> PREP2_x_PPSS3     0.8342444 0.03536430 0.000000e+00 0.7649317
## REP_x_POL -> PREP3_x_PPSS1     0.6736451 0.12948899 1.967998e-07 0.4198514
## REP_x_POL -> PREP3_x_PPSS2     0.8011944 0.03780427 0.000000e+00 0.7270994
## REP_x_POL -> PREP3_x_PPSS3     0.7902063 0.06416741 0.000000e+00 0.6644405
## REP_x_POL -> PREP4_x_PPSS1     0.6854770 0.06906812 0.000000e+00 0.5501059
## REP_x_POL -> PREP4_x_PPSS2     0.5531922 0.06212434 0.000000e+00 0.4314307
```

```
## REP_x_POL -> PREP4_x_PPSS3    0.6405843 0.05794028 0.000000e+00 0.5270235
##                               97.5% CI
## TRUST -> TRST1              0.9245562
## TRUST -> TRST2              0.9539164
## TRUST -> TRST3              0.9425522
## TRUST -> TRST4              0.8525933
## SEC -> PSEC1                0.8029877
## SEC -> PSEC2                0.9051581
## SEC -> PSEC3                0.8882399
## SEC -> PSEC4                0.8007551
## REP -> PREP1                0.8426435
## REP -> PREP2                0.9715724
## REP -> PREP3                0.9658307
## REP -> PREP4                0.6548817
## INV -> PINV1                0.9400013
## INV -> PINV2                1.0150518
## INV -> PINV3                0.8273007
## POL -> PPSS1                0.8905156
## POL -> PPSS2                0.8822771
## POL -> PPSS3                0.9315961
## FAML -> FAML1               1.0000000
## REP_x_POL -> PREP1_x_PPSS1 0.8918338
## REP_x_POL -> PREP1_x_PPSS2 0.8760387
## REP_x_POL -> PREP1_x_PPSS3 0.8861744
## REP_x_POL -> PREP2_x_PPSS1 0.9162567
## REP_x_POL -> PREP2_x_PPSS2 0.8747873
## REP_x_POL -> PREP2_x_PPSS3 0.9035572
## REP_x_POL -> PREP3_x_PPSS1 0.9274389
## REP_x_POL -> PREP3_x_PPSS2 0.8752894
## REP_x_POL -> PREP3_x_PPSS3 0.9159721
## REP_x_POL -> PREP4_x_PPSS1 0.8208480
## REP_x_POL -> PREP4_x_PPSS2 0.6749536
## REP_x_POL -> PREP4_x_PPSS3 0.7541452
```

iii. Regression coefficients of paths between factors, and their pvalues

```
sec_cf_report$paths$coefficients
```

```
##                    SEC     TRUST
## R^2        0.540381651 0.4951084
## REP        0.299536782        NA
## INV        0.214253245        NA
## POL        0.376401499        NA
## FAML      -0.008837653        NA
## REP_x_POL  0.008355287        NA
## SEC                 NA 0.7036394
```

```
sec_cf_report$paths$pvalues
```

```
##                    SEC TRUST
## REP       3.817182e-05    NA
```

```
## INV       3.534482e-03    NA
## POL       4.380975e-09    NA
## FAML      8.996836e-01    NA
## REP_x_POL 8.516847e-01    NA
## SEC                NA     0
```