hw15

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```
library(seminr)
sec_q <- read.table("security_data_sem.csv", header = TRUE, sep = ",")
```

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:

```
sec_q_intxn_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", single_item("FAML1")),
  interaction_term(iv="REP", moderator="POL", method=orthogonal)
)
```

(ii). Structural Model – paths between constructs as shown in this causal model:

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

b. Show us the following results in table or figure

formats:

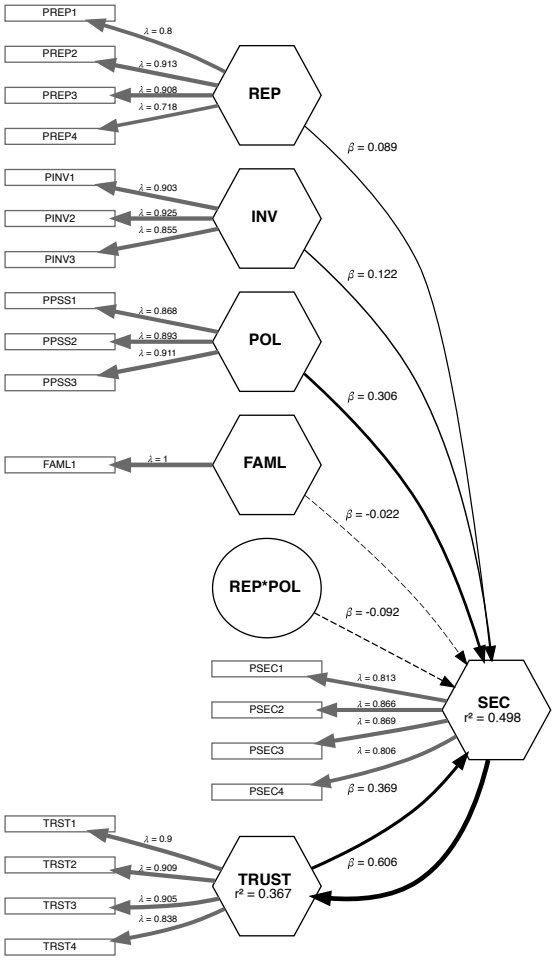
(i) Plot a figure of the estimated model

```
sec_q_intxn_pls <- estimate_pls(data = sec_q,
                                measurement_model = sec_q_intxn_mm,
                                structural_model = sec_q_intxn_sm)
```

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

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

```
plot(sec_q_intxn_pls)
```



(ii) Weights and loadings of composites

```
sec_q_report <- summary(sec_q_intxn_pls)

# weight
sec_q_report$weights
```

```
##             TRUST   REP   INV   POL  FAML REP*POL   SEC
## TRST1       0.282 0.000 0.000 0.000 0.000   0.000 0.000
## TRST2       0.280 0.000 0.000 0.000 0.000   0.000 0.000
## TRST3       0.286 0.000 0.000 0.000 0.000   0.000 0.000
## TRST4       0.278 0.000 0.000 0.000 0.000   0.000 0.000
## PSEC1       0.000 0.000 0.000 0.000 0.000   0.000 0.277
## PSEC2       0.000 0.000 0.000 0.000 0.000   0.000 0.315
## PSEC3       0.000 0.000 0.000 0.000 0.000   0.000 0.309
## PSEC4       0.000 0.000 0.000 0.000 0.000   0.000 0.290
## PREP1       0.000 0.215 0.000 0.000 0.000   0.000 0.000
## PREP2       0.000 0.334 0.000 0.000 0.000   0.000 0.000
## PREP3       0.000 0.349 0.000 0.000 0.000   0.000 0.000
## PREP4       0.000 0.287 0.000 0.000 0.000   0.000 0.000
## PINV1       0.000 0.000 0.363 0.000 0.000   0.000 0.000
## PINV2       0.000 0.000 0.395 0.000 0.000   0.000 0.000
## PINV3       0.000 0.000 0.358 0.000 0.000   0.000 0.000
## PPSS1       0.000 0.000 0.000 0.360 0.000   0.000 0.000
## PPSS2       0.000 0.000 0.000 0.395 0.000   0.000 0.000
## PPSS3       0.000 0.000 0.000 0.367 0.000   0.000 0.000
## FAML1       0.000 0.000 0.000 0.000 1.000   0.000 0.000
## PREP1*PPSS1 0.000 0.000 0.000 0.000 0.000   0.239 0.000
## PREP1*PPSS2 0.000 0.000 0.000 0.000 0.000   0.032 0.000
## PREP1*PPSS3 0.000 0.000 0.000 0.000 0.000   0.021 0.000
## PREP2*PPSS1 0.000 0.000 0.000 0.000 0.000   0.045 0.000
## PREP2*PPSS2 0.000 0.000 0.000 0.000 0.000  -0.105 0.000
## PREP2*PPSS3 0.000 0.000 0.000 0.000 0.000  -0.229 0.000
## PREP3*PPSS1 0.000 0.000 0.000 0.000 0.000  -0.341 0.000
## PREP3*PPSS2 0.000 0.000 0.000 0.000 0.000   0.094 0.000
## PREP3*PPSS3 0.000 0.000 0.000 0.000 0.000   0.108 0.000
## PREP4*PPSS1 0.000 0.000 0.000 0.000 0.000   0.443 0.000
## PREP4*PPSS2 0.000 0.000 0.000 0.000 0.000   0.383 0.000
## PREP4*PPSS3 0.000 0.000 0.000 0.000 0.000   0.272 0.000
```

```
# loadongs
sec_q_report$loadings
```

```
##              TRUST    REP    INV    POL   FAML REP*POL    SEC
## TRST1        0.900  0.000  0.000  0.000  0.000  -0.000  0.000
## TRST2        0.909  0.000  0.000  0.000  0.000  -0.000  0.000
## TRST3        0.905  0.000  0.000  0.000  0.000  -0.000  0.000
## TRST4        0.838  0.000  0.000  0.000  0.000  -0.000  0.000
## PSEC1        0.000  0.000  0.000  0.000  0.000  -0.000  0.813
## PSEC2        0.000  0.000  0.000  0.000  0.000  -0.000  0.866
## PSEC3        0.000  0.000  0.000  0.000  0.000  -0.000  0.869
## PSEC4        0.000  0.000  0.000  0.000  0.000  -0.000  0.806
## PREP1        0.000  0.800  0.000  0.000  0.000   0.000  0.000
## PREP2        0.000  0.913  0.000  0.000  0.000   0.000  0.000
## PREP3        0.000  0.908  0.000  0.000  0.000   0.000  0.000
## PREP4        0.000  0.718  0.000  0.000  0.000   0.000  0.000
## PINV1        0.000  0.000  0.903  0.000  0.000  -0.000  0.000
## PINV2        0.000  0.000  0.925  0.000  0.000  -0.000  0.000
## PINV3        0.000  0.000  0.855  0.000  0.000  -0.000  0.000
## PPSS1        0.000  0.000  0.000  0.868  0.000   0.000  0.000
## PPSS2        0.000  0.000  0.000  0.893  0.000   0.000  0.000
## PPSS3        0.000  0.000  0.000  0.911  0.000   0.000  0.000
## FAML1        0.000  0.000  0.000  0.000  1.000  -0.000  0.000
## PREP1*PPSS1 -0.000 -0.000 -0.000 -0.000 -0.000   0.579 -0.000
## PREP1*PPSS2 -0.000 -0.000 -0.000  0.000 -0.000   0.509 -0.000
## PREP1*PPSS3 -0.000 -0.000 -0.000 -0.000 -0.000   0.505 -0.000
## PREP2*PPSS1 -0.000 -0.000 -0.000 -0.000 -0.000   0.507 -0.000
## PREP2*PPSS2  0.000 -0.000 -0.000  0.000 -0.000   0.419  0.000
## PREP2*PPSS3  0.000 -0.000 -0.000 -0.000  0.000   0.334  0.000
## PREP3*PPSS1  0.000 -0.000 -0.000 -0.000  0.000   0.234  0.000
## PREP3*PPSS2 -0.000 -0.000 -0.000  0.000 -0.000   0.553 -0.000
## PREP3*PPSS3 -0.000 -0.000 -0.000 -0.000  0.000   0.464 -0.000
## PREP4*PPSS1 -0.000  0.000 -0.000  0.000  0.000   0.899 -0.000
## PREP4*PPSS2  0.000 -0.000 -0.000 -0.000 -0.000   0.836 -0.000
## PREP4*PPSS3  0.000  0.000 -0.000  0.000  0.000   0.859 -0.000
```

(iii) Regression coefficients of paths between factors

```
sec_q_intxn_pls$path_coef
```

```
##             TRUST REP INV POL FAML REP*POL         SEC
## TRUST   0.0000000   0   0   0    0       0  0.36903037
## REP     0.0000000   0   0   0    0       0  0.08850419
## INV     0.0000000   0   0   0    0       0  0.12235224
## POL     0.0000000   0   0   0    0       0  0.30586450
## FAML    0.0000000   0   0   0    0       0 -0.02200308
## REP*POL 0.0000000   0   0   0    0       0 -0.09223643
## SEC     0.6056111   0   0   0    0       0  0.00000000
```

(iv) Bootstrapped path coefficients: t-values, 95% CI

```
boot_pls <- bootstrap_model(sec_q_intxn_pls, nboot = 100)
```

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

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

```
summary(boot_pls)$bootstrapped_total_paths
```

```
##                     Original Est. Bootstrap Mean Bootstrap SD T Stat. 2.5% CI
## TRUST  ->  TRUST            0.288          0.299        0.070   4.118   0.174
## TRUST  ->  SEC              0.475          0.486        0.094   5.072   0.306
## REP  ->  TRUST              0.069          0.066        0.048   1.437  -0.033
## REP  ->  SEC                0.114          0.108        0.078   1.457  -0.055
## INV  ->  TRUST              0.095          0.106        0.041   2.301   0.025
## INV  ->  SEC                0.158          0.173        0.068   2.323   0.040
## POL  ->  TRUST              0.239          0.242        0.045   5.338   0.171
## POL  ->  SEC                0.394          0.395        0.064   6.144   0.292
## FAML  ->  TRUST            -0.017         -0.021        0.045  -0.385  -0.110
## FAML  ->  SEC              -0.028         -0.034        0.072  -0.394  -0.184
## REP*POL  ->  TRUST         -0.072         -0.014        0.095  -0.761  -0.150
## REP*POL  ->  SEC           -0.119         -0.023        0.153  -0.779  -0.233
## SEC  ->  TRUST              0.780          0.797        0.085   9.219   0.649
## SEC  ->  SEC                0.288          0.299        0.070   4.118   0.174
##                     97.5% CI
## TRUST  ->  TRUST       0.410
## TRUST  ->  SEC         0.661
## REP  ->  TRUST         0.142
## REP  ->  SEC           0.233
## INV  ->  TRUST         0.176
## INV  ->  SEC           0.293
## POL  ->  TRUST         0.357
## POL  ->  SEC           0.546
## FAML  ->  TRUST        0.063
## FAML  ->  SEC          0.097
## REP*POL  ->  TRUST     0.150
## REP*POL  ->  SEC       0.238
## SEC  ->  TRUST         0.925
## SEC  ->  SEC           0.410
```

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() function to convert your earlier

measurement model to being entirely reflective.

```
sec_q_intxn_cf_mm <- constructs(
  reflective("TRUST", multi_items("TRST", 1:4)),
  reflective("SEC", multi_items("PSEC", 1:4)),
  reflective("REP", multi_items("PREP", 1:4)),
  reflective("INV", multi_items("PINV", 1:3)),
  reflective("POL", multi_items("PPSS", 1:3)),
  reflective("FAML", single_item("FAML1")),
  interaction_term(iv="REP", moderator="POL", method=orthogonal)
)
```

(ii) Use the same structural model as before.

```
sec_q_intxn_sm <- relationships(
  paths(from = c("TRUST", "REP", "INV", "POL", "FAML", "REP*POL"),
        to = "SEC"),
  paths(from = "SEC", to = "TRUST")
)
sec_q_intxn__cf_pls <- estimate_cbsem( data = sec_q,
                              measurement_model = sec_q_intxn_cf_mm,
                              structural_model = sec_q_intxn_sm)
```

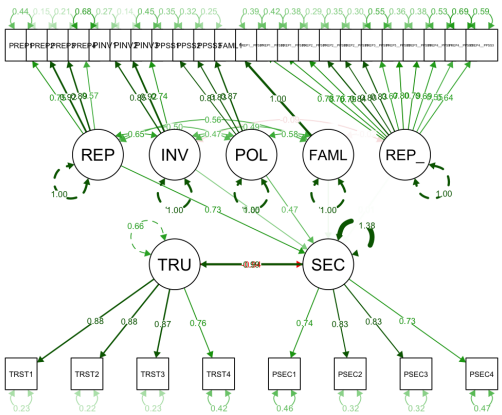
```
## Generating the seminr model for CBSEM
```

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!)

```
plot(sec_q_intxn__cf_pls)
```

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



```
## NULL
```

(ii) Loadings of composites

```
sec_q_intxn__cf_pls_report <- summary(sec_q_intxn__cf_pls)
sec_q_intxn__cf_pls_report$loadings
```

```
## $coefficients
##           TRUST       SEC       REP       INV       POL FAML
## TRST1 0.8768770        NA        NA        NA        NA   NA
## TRST2 0.8818581        NA        NA        NA        NA   NA
## TRST3 0.8749247        NA        NA        NA        NA   NA
## TRST4 0.7639165        NA        NA        NA        NA   NA
## PSEC1        NA 0.7357445        NA        NA        NA   NA
## PSEC2        NA 0.8268043        NA        NA        NA   NA
## PSEC3        NA 0.8251951        NA        NA        NA   NA
## PSEC4        NA 0.7255716        NA        NA        NA   NA
## PREP1        NA        NA 0.7504425        NA        NA   NA
## PREP2        NA        NA 0.9214885        NA        NA   NA
## PREP3        NA        NA 0.8880340        NA        NA   NA
## PREP4        NA        NA 0.5651857        NA        NA   NA
## PINV1        NA        NA        NA 0.8531915        NA   NA
## PINV2        NA        NA        NA 0.9247068        NA   NA
## PINV3        NA        NA        NA 0.7389062        NA   NA
## PPSS1        NA        NA        NA        NA 0.8051744   NA
## PPSS2        NA        NA        NA        NA 0.8267129   NA
## PPSS3        NA        NA        NA        NA 0.8679870   NA
## FAML1        NA        NA        NA        NA        NA    1
##
## $significance
##                              Std Estimate         SE      t-Value   2.5% CI
## TRUST -> TRST1                  0.8768770 0.02366287 0.000000e+00 0.8304986
## TRUST -> TRST2                  0.8818581 0.03435795 0.000000e+00 0.8145178
## TRUST -> TRST3                  0.8749247 0.03720447 0.000000e+00 0.8020053
## TRUST -> TRST4                  0.7639165 0.04787542 0.000000e+00 0.6700824
## SEC -> PSEC1                    0.7357445 0.03729459 0.000000e+00 0.6626484
## SEC -> PSEC2                    0.8268043 0.04360497 0.000000e+00 0.7413402
## SEC -> PSEC3                    0.8251951 0.03671594 0.000000e+00 0.7532332
## SEC -> PSEC4                    0.7255716 0.03869267 0.000000e+00 0.6497353
## REP -> PREP1                    0.7504425 0.04515446 0.000000e+00 0.6619414
## REP -> PREP2                    0.9214885 0.02681126 0.000000e+00 0.8689394
## REP -> PREP3                    0.8880340 0.03994637 0.000000e+00 0.8097406
## REP -> PREP4                    0.5651857 0.04588195 0.000000e+00 0.4752588
## INV -> PINV1                    0.8531915 0.04392630 0.000000e+00 0.7670975
## INV -> PINV2                    0.9247068 0.04539342 0.000000e+00 0.8357373
## INV -> PINV3                    0.7389062 0.04495992 0.000000e+00 0.6507864
## POL -> PPSS1                    0.8051744 0.04434595 0.000000e+00 0.7182580
## POL -> PPSS2                    0.8267129 0.02849059 0.000000e+00 0.7708724
## POL -> PPSS3                    0.8679870 0.03271453 0.000000e+00 0.8038677
## FAML -> FAML1                   1.0000000 0.00000000           NA 1.0000000
## REP_x_POL -> PREP1_x_PPSS1      0.7781312 0.05804235 0.000000e+00 0.6643703
## REP_x_POL -> PREP1_x_PPSS2      0.7597713 0.05932523 0.000000e+00 0.6434960
## REP_x_POL -> PREP1_x_PPSS3      0.7879011 0.05015445 0.000000e+00 0.6896002
## REP_x_POL -> PREP2_x_PPSS1      0.8447180 0.03651197 0.000000e+00 0.7731558
## REP_x_POL -> PREP2_x_PPSS2      0.8034602 0.03637404 0.000000e+00 0.7321684
## REP_x_POL -> PREP2_x_PPSS3      0.8342415 0.03535346 0.000000e+00 0.7649500
## REP_x_POL -> PREP3_x_PPSS1      0.6736354 0.12948936 1.968952e-07 0.4198409
## REP_x_POL -> PREP3_x_PPSS2      0.8012108 0.03779536 0.000000e+00 0.7271333
## REP_x_POL -> PREP3_x_PPSS3      0.7902191 0.06416403 0.000000e+00 0.6644599
## REP_x_POL -> PREP4_x_PPSS1      0.6854977 0.06900666 0.000000e+00 0.5502471
## REP_x_POL -> PREP4_x_PPSS2      0.5532312 0.06205622 0.000000e+00 0.4316032
## REP_x_POL -> PREP4_x_PPSS3      0.6406124 0.05789116 0.000000e+00 0.5271478
```

```
##                               97.5% CI
## TRUST -> TRST1              0.9232553
## TRUST -> TRST2              0.9491985
## TRUST -> TRST3              0.9478441
## TRUST -> TRST4              0.8577506
## SEC -> PSEC1                0.8088405
## SEC -> PSEC2                0.9122685
## SEC -> PSEC3                0.8971570
## SEC -> PSEC4                0.8014078
## REP -> PREP1                0.8389437
## REP -> PREP2                0.9740376
## REP -> PREP3                0.9663275
## REP -> PREP4                0.6551127
## INV -> PINV1                0.9392854
## INV -> PINV2                1.0136763
## INV -> PINV3                0.8270260
## POL -> PPSS1                0.8920909
## POL -> PPSS2                0.8825535
## POL -> PPSS3                0.9321063
## FAML -> FAML1               1.0000000
## REP_x_POL -> PREP1_x_PPSS1 0.8918921
## REP_x_POL -> PREP1_x_PPSS2 0.8760467
## REP_x_POL -> PREP1_x_PPSS3 0.8862020
## REP_x_POL -> PREP2_x_PPSS1 0.9162801
## REP_x_POL -> PREP2_x_PPSS2 0.8747520
## REP_x_POL -> PREP2_x_PPSS3 0.9035330
## REP_x_POL -> PREP3_x_PPSS1 0.9274298
## REP_x_POL -> PREP3_x_PPSS2 0.8752884
## REP_x_POL -> PREP3_x_PPSS3 0.9159783
## REP_x_POL -> PREP4_x_PPSS1 0.8207483
## REP_x_POL -> PREP4_x_PPSS2 0.6748591
## REP_x_POL -> PREP4_x_PPSS3 0.7540769
```

(iii) Regression coefficients of paths between factors, and their p-values

```
sec_q_intxn__cf_pls_report$paths[c("coefficients", "pvalues")]
```

```
## $coefficients
##                    SEC     TRUST
## R^2       -0.38070498 0.3416262
## TRUST     -0.94217900        NA
## REP        0.72591573        NA
## INV        0.34554772        NA
## POL        0.46818286        NA
## FAML       0.04662793        NA
## REP_x_POL  0.01135219        NA
## SEC                NA 0.9881738
##
## $pvalues
##                     SEC TRUST
## TRUST     3.267278e-03    NA
## REP       6.913693e-04    NA
## INV       6.577056e-03    NA
## POL       4.310737e-06    NA
## FAML      6.983184e-01    NA
## REP_x_POL 8.813308e-01    NA
## SEC                NA     0
```