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```
library(seminr)
```

```
## Warning:      'seminr'          R      4.3.3
```

```
library(tidyr)
library(tidyverse)
```

```
## Warning:      'readr'          R      4.3.2
```

### Question 1(a)

```
df <- read.csv('security_data_sem.csv', header=TRUE)
#head(df)
```

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

sec_sm <- relationships(
  paths(from=c('REP', 'INV', 'POL', 'FAML', 'REP*POL'), to='SEC'),
  paths(from='SEC', to='TRUST')
)

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

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

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

### Question 1(b)

```
plot(sec_pls)
```



```
sec_report <- summary(sec_pls)
knitr::kable(sec_report$weights)
```

	REP	INV	POL	FAML	REP*POL	SEC	TRUST
TRST1	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.2821311
TRST2	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.2803746
TRST3	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.2855684
TRST4	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.2778795
PSEC1	0.0000000	0.0000000	0.0000000	0	0.0000000	0.2770568	0.0000000
PSEC2	0.0000000	0.0000000	0.0000000	0	0.0000000	0.3146606	0.0000000
PSEC3	0.0000000	0.0000000	0.0000000	0	0.0000000	0.3074358	0.0000000
PSEC4	0.0000000	0.0000000	0.0000000	0	0.0000000	0.2918910	0.0000000
PREP1	0.2150721	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP2	0.3337367	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP3	0.3492133	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP4	0.2868746	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV1	0.0000000	0.3633600	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV2	0.0000000	0.3950425	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV3	0.0000000	0.3584780	0.0000000	0	0.0000000	0.0000000	0.0000000
PPSS1	0.0000000	0.0000000	0.3603145	0	0.0000000	0.0000000	0.0000000
PPSS2	0.0000000	0.0000000	0.3947849	0	0.0000000	0.0000000	0.0000000
PPSS3	0.0000000	0.0000000	0.3673689	0	0.0000000	0.0000000	0.0000000
FAML1	0.0000000	0.0000000	0.0000000	1	0.0000000	0.0000000	0.0000000
PREP1*PPSS1	0.0000000	0.0000000	0.0000000	0	0.2389891	0.0000000	0.0000000
PREP1*PPSS2	0.0000000	0.0000000	0.0000000	0	0.0312942	0.0000000	0.0000000
PREP1*PPSS3	0.0000000	0.0000000	0.0000000	0	0.0211621	0.0000000	0.0000000
PREP2*PPSS1	0.0000000	0.0000000	0.0000000	0	0.0458880	0.0000000	0.0000000

	REP	INV	POL	FAML	REP*POL	SEC	TRUST
PREP2*PPSS2	0.0000000	0.0000000	0.0000000	0	-0.1042473	0.0000000	0.0000000
PREP2*PPSS3	0.0000000	0.0000000	0.0000000	0	-0.2282503	0.0000000	0.0000000
PREP3*PPSS1	0.0000000	0.0000000	0.0000000	0	-0.3407540	0.0000000	0.0000000
PREP3*PPSS2	0.0000000	0.0000000	0.0000000	0	0.0948581	0.0000000	0.0000000
PREP3*PPSS3	0.0000000	0.0000000	0.0000000	0	0.1084730	0.0000000	0.0000000
PREP4*PPSS1	0.0000000	0.0000000	0.0000000	0	0.4430212	0.0000000	0.0000000
PREP4*PPSS2	0.0000000	0.0000000	0.0000000	0	0.3822527	0.0000000	0.0000000
PREP4*PPSS3	0.0000000	0.0000000	0.0000000	0	0.2713834	0.0000000	0.0000000

```
knitr::kable(sec_report$loadings)
```

	REP	INV	POL	FAML	REP*POL	SEC	TRUST
TRST1	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.8997771
TRST2	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.9092172
TRST3	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.9045581
TRST4	0.0000000	0.0000000	0.0000000	0	0.0000000	0.0000000	0.8381701
PSEC1	0.0000000	0.0000000	0.0000000	0	0.0000000	0.8133463	0.0000000
PSEC2	0.0000000	0.0000000	0.0000000	0	0.0000000	0.8652000	0.0000000
PSEC3	0.0000000	0.0000000	0.0000000	0	0.0000000	0.8680084	0.0000000
PSEC4	0.0000000	0.0000000	0.0000000	0	0.0000000	0.8069989	0.0000000
PREP1	0.7997023	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP2	0.9131786	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP3	0.9084366	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PREP4	0.7181080	0.0000000	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV1	0.0000000	0.9034647	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV2	0.0000000	0.9248848	0.0000000	0	0.0000000	0.0000000	0.0000000
PINV3	0.0000000	0.8545806	0.0000000	0	0.0000000	0.0000000	0.0000000
PPSS1	0.0000000	0.0000000	0.8677688	0	0.0000000	0.0000000	0.0000000
PPSS2	0.0000000	0.0000000	0.8931876	0	0.0000000	0.0000000	0.0000000
PPSS3	0.0000000	0.0000000	0.9111096	0	0.0000000	0.0000000	0.0000000
FAML1	0.0000000	0.0000000	0.0000000	1	0.0000000	0.0000000	0.0000000
PREP1*PPSS1	0.0000000	0.0000000	0.0000000	0	0.5805131	0.0000000	0.0000000
PREP1*PPSS2	0.0000000	0.0000000	0.0000000	0	0.5098830	0.0000000	0.0000000
PREP1*PPSS3	0.0000000	0.0000000	0.0000000	0	0.5058808	0.0000000	0.0000000
PREP2*PPSS1	0.0000000	0.0000000	0.0000000	0	0.5093625	0.0000000	0.0000000
PREP2*PPSS2	0.0000000	0.0000000	0.0000000	0	0.4208366	0.0000000	0.0000000
PREP2*PPSS3	0.0000000	0.0000000	0.0000000	0	0.3356061	0.0000000	0.0000000
PREP3*PPSS1	0.0000000	0.0000000	0.0000000	0	0.2356078	0.0000000	0.0000000
PREP3*PPSS2	0.0000000	0.0000000	0.0000000	0	0.5546226	0.0000000	0.0000000
PREP3*PPSS3	0.0000000	0.0000000	0.0000000	0	0.4656265	0.0000000	0.0000000
PREP4*PPSS1	0.0000000	0.0000000	0.0000000	0	0.8995792	0.0000000	0.0000000
PREP4*PPSS2	0.0000000	0.0000000	0.0000000	0	0.8361087	0.0000000	0.0000000
PREP4*PPSS3	0.0000000	0.0000000	0.0000000	0	0.8589106	0.0000000	0.0000000

```
knitr::kable(sec_report$paths)
```

	SEC	TRUST
R <sup>2</sup>	0.4195101	0.3667984
AdjR <sup>2</sup>	0.4122358	0.3652272
REP	0.2470065	NA
INV	0.1806538	NA
POL	0.3385910	NA
FAML	0.0105048	NA
REP*POL	-0.1046461	NA
SEC	NA	0.6056388

```
boot_pls <- bootstrap_model(sec_pls, nboot = 1000)
```

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

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

```
boot_report <- summary(boot_pls)
knitr::kable(boot_report$bootstrapped_paths)
```

	Original Est.	Bootstrap Mean	Bootstrap SD	T Stat.	2.5% CI	97.5% CI
REP -> SEC	0.2470065	0.2410046	0.0583555	4.2327863	0.1240792	0.3522542
INV -> SEC	0.1806538	0.1837582	0.0587831	3.0732291	0.0658664	0.2965749
POL -> SEC	0.3385910	0.3430222	0.0573092	5.9081396	0.2291077	0.4527440
FAML -> SEC	0.0105048	0.0123111	0.0565892	0.1856330	-0.0964458	0.1273450
REP*POL -> SEC	-0.1046461	-0.0181686	0.1275692	-0.8203086	-0.2034882	0.2015397
SEC -> TRUST	0.6056388	0.6075042	0.0346350	17.4863054	0.5389320	0.6703280

## Question 2(a)

```
sec_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)
)

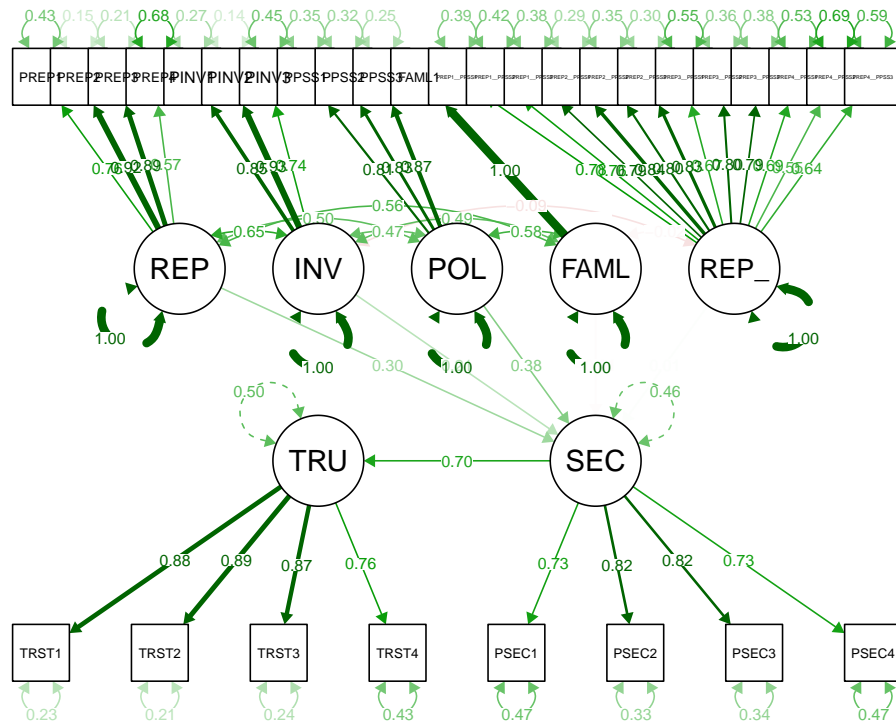
sec_cf_pls <- estimate_cbsem(
  data=df,
  measurement_model=sec_cf_mm,
  structural_model=sec_sm
)
```

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

## Question 2(b)

```
plot(sec_cf_pls)
```

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



```
## NULL
```

```
sec_cf_report <- summary(sec_cf_pls)
knitr::kable(sec_cf_pls$factor_loadings)
```

	TRUST	SEC	REP	INV	POL	FAML	REP_x_POL
TRST1	0.8800240	0.0000000	0.0000000	0.0000000	0.0000000	0	0.0000000
TRST2	0.8886342	0.0000000	0.0000000	0.0000000	0.0000000	0	0.0000000
TRST3	0.8690644	0.0000000	0.0000000	0.0000000	0.0000000	0	0.0000000
TRST4	0.7575988	0.0000000	0.0000000	0.0000000	0.0000000	0	0.0000000
PSEC1	0.0000000	0.7308766	0.0000000	0.0000000	0.0000000	0	0.0000000
PSEC2	0.0000000	0.8173481	0.0000000	0.0000000	0.0000000	0	0.0000000
PSEC3	0.0000000	0.8151708	0.0000000	0.0000000	0.0000000	0	0.0000000
PSEC4	0.0000000	0.7260444	0.0000000	0.0000000	0.0000000	0	0.0000000
PREP1	0.0000000	0.0000000	0.7551328	0.0000000	0.0000000	0	0.0000000

	TRUST	SEC	REP	INV	POL	FAML	REP_x_POL
PREP2	0.0000000	0.0000000	0.9199208	0.0000000	0.0000000	0	0.0000000
PREP3	0.0000000	0.0000000	0.8871362	0.0000000	0.0000000	0	0.0000000
PREP4	0.0000000	0.0000000	0.5650059	0.0000000	0.0000000	0	0.0000000
PINV1	0.0000000	0.0000000	0.0000000	0.8520004	0.0000000	0	0.0000000
PINV2	0.0000000	0.0000000	0.0000000	0.9257476	0.0000000	0	0.0000000
PINV3	0.0000000	0.0000000	0.0000000	0.7388750	0.0000000	0	0.0000000
PPSS1	0.0000000	0.0000000	0.0000000	0.0000000	0.8051533	0	0.0000000
PPSS2	0.0000000	0.0000000	0.0000000	0.0000000	0.8272576	0	0.0000000
PPSS3	0.0000000	0.0000000	0.0000000	0.0000000	0.8674335	0	0.0000000
FAML1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	1	0.0000000
PREP1_x_PPSS1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.7781584
PREP1_x_PPSS2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.7597768
PREP1_x_PPSS3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.7879106
PREP2_x_PPSS1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.8447368
PREP2_x_PPSS2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.8034561
PREP2_x_PPSS3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.8342444
PREP3_x_PPSS1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.6736451
PREP3_x_PPSS2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.8011944
PREP3_x_PPSS3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.7902063
PREP4_x_PPSS1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.6854770
PREP4_x_PPSS2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.5531922
PREP4_x_PPSS3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0	0.6405843

```
knitr::kable(sec_cf_report$paths$coefficients)
```

	SEC	TRUST
R <sup>2</sup>	0.5403817	0.4951084
REP	0.2995368	NA
INV	0.2142532	NA
POL	0.3764015	NA
FAML	-0.0088377	NA
REP_x_POL	0.0083553	NA
SEC	NA	0.7036394

```
knitr::kable(sec_cf_report$paths$pvalues)
```

	SEC	TRUST
REP	0.0000382	NA
INV	0.0035345	NA
POL	0.0000000	NA
FAML	0.8996836	NA
REP_x_POL	0.8516847	NA
SEC	NA	0

**I used knitr library to  
print pretty tables.  
May I request for extra  
point? (please)**

