MY455 Week 9
Homework 4
Structural Equation Models

Name of R-nerd

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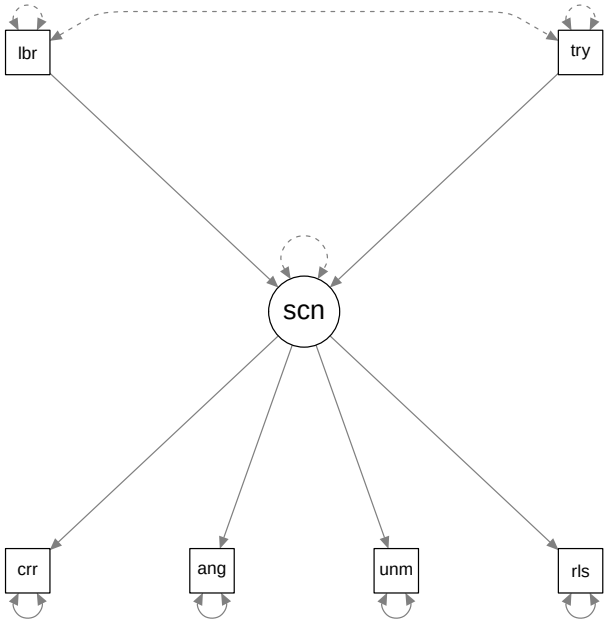
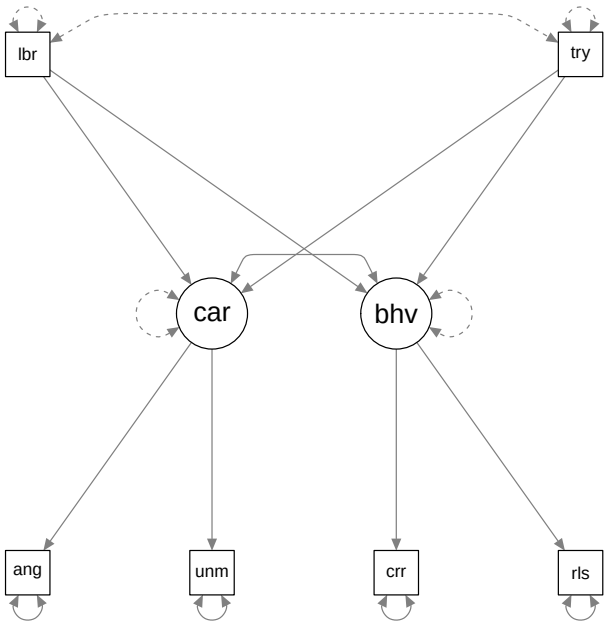
```
> BES.model <- 'scandal =~ corrupt + angry + unimport + rules
+               scandal ~ labour + tory'
> BES.model.fit <- sem(BES.model, data = expenses, std.lv = TRUE)
> summary(BES.model.fit)

lavaan (0.5-16) converged normally after  27 iterations

  Number of observations                          1415

  Estimator                                         ML
  Minimum Function Test Statistic               64.487
  Degrees of freedom                                 8
  P-value (Chi-square)                           0.000

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)
Latent variables:
  scandal =~
    corrupt          -0.698    0.035  -19.997    0.000
    angry            -0.422    0.023  -18.426    0.000
    unimport          0.447    0.029   15.511    0.000
    rules             0.784    0.036   21.575    0.000
```

```
Regressions:
  scandal ~
    labour            0.269    0.078    3.442    0.001
    tory              0.265    0.078    3.399    0.001

Variances:
    corrupt           0.814    0.044
    angry             0.388    0.019
    unimport          0.687    0.030
    rules             0.769    0.048
    scandal           1.000
```



```
> BES.model.elab <- 'care =~ angry + unimport
+                    behave =~ corrupt + rules
+                    care ~ labour + tory
+                    behave ~ labour + tory
+                    care ~~ behave'
> BES.model.elab.fit <- sem(BES.model.elab, data = expenses, std.lv = TRUE
> summary(BES.model.elab.fit)

lavaan (0.5-16) converged normally after  35 iterations

  Number of observations                          1415

  Estimator                                         ML
  Minimum Function Test Statistic               30.937
  Degrees of freedom                                 5
  P-value (Chi-square)                           0.000

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)
Latent variables:
  care =~
    angry            -0.492    0.027  -18.222    0.000
    unimport          0.503    0.031   16.184    0.000
  behave =~
    corrupt          -0.725    0.037  -19.786    0.000
    rules             0.817    0.039   20.920    0.000

Regressions:
  care ~
    labour            0.254    0.089    2.874    0.004
    tory              0.165    0.088    1.878    0.060
  behave ~
    labour            0.242    0.082    2.944    0.003
    tory              0.289    0.082    3.516    0.000

Covariances:
  care ~~
```

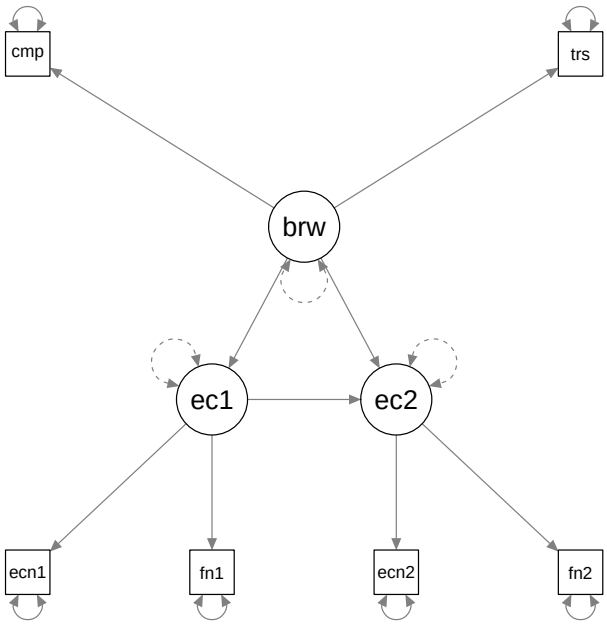
```
    behave            0.771    0.039   19.789    0.000

Variances:
    angry             0.323    0.024
    unimport          0.635    0.032
    corrupt           0.774    0.047
    rules             0.715    0.054
    care              1.000
    behave            1.000
```



1. First question

```
> BES.model.recurse <- 'ec1 =~ econ1 + finance1
+                       ec2 =~ econ2 + finance2
+                       brown =~ compet + trust
+                       ec1 ~ brown
+                       ec2 ~ brown + ec1'
> BES.model.recurse.fit <- sem(BES.model.recurse, data = finances, std.lv
> summary(BES.model.recurse.fit)

lavaan (0.5-16) converged normally after  30 iterations

  Number of observations                          1385

  Estimator                                         ML
  Minimum Function Test Statistic               29.369
  Degrees of freedom                                 6
  P-value (Chi-square)                           0.000

Parameter estimates:

  Information                                 Expected
  Standard Errors                             Standard

                   Estimate  Std.err  Z-value  P(>|z|)
Latent variables:
  ec1 =~
    econ1             0.672    0.023   28.825    0.000
    finance1          0.710    0.025   28.597    0.000
  ec2 =~
    econ2             0.604    0.023   26.494    0.000
    finance2          0.615    0.023   26.633    0.000
  brown =~
    compet            2.472    0.058   42.395    0.000
    trust             2.685    0.062   43.325    0.000

Regressions:
  ec1 ~
    brown             0.990    0.051   19.468    0.000
  ec2 ~
    brown             0.398    0.060    6.684    0.000
    ec1               0.695    0.055   12.568    0.000
```

```
Variances:
    econ1             0.384    0.026
    finance1          0.503    0.031
    econ2             0.327    0.025
    finance2          0.403    0.028
    compet            1.075    0.109
    trust             1.032    0.126
    ec1               1.000
    ec2               1.000
    brown             1.000
```



2. Second question