R Notebook: Predictors of Dropout

Contents

clear environment

```
rm(list = ls(all.names = TRUE))
```

Load library

```
#install.packages("lavaan")
#install.packages("xtable")
#install.packages("kableExtra")
#install.packages("semPlot")

library(tidyverse)
```

```
## -- Attaching packages ---------------------------------------------------------------------------
## v ggplot2 2.2.1     v purrr   0.2.4
## v tibble  1.4.2     v dplyr   0.7.4
## v tidyr   0.8.0     v stringr 1.2.0
## v readr   1.1.1     v forcats 0.2.0
```

```
## -- Conflicts ------------------------------------------------------------------------------------
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(lavaan)
```

```
## This is lavaan 0.5-23.1097
```

```
## lavaan is BETA software! Please report any bugs.
```

```
library(GGally)
```

```
##
## Attaching package: 'GGally'
```

```
## The following object is masked from 'package:dplyr':
##
##     nasa
```

```
library(xtable)
library("kableExtra")
library(knitr)
library(semPlot)
```

Load Data

```
att  <-   read_csv("R_pois.csv")
drop <-   read_csv("R_log.csv")
```

Subset items

```
sem_items <- drop %>%
  select(risk_1:risk_32)

items <- c("risk_1","risk_2","risk_3","risk_4","risk_5","risk_6","risk_7","risk_8","risk_9","risk_10","
```

Frequency table

```
#Count responses: plyr::count
count_all <- map(sem_items, plyr::count)

#COnvert to datframe
count_all <-  as.data.frame(count_all)

#Get necessary info
count_all <- count_all %>%
  mutate(selection = ifelse(risk_1.x == 1, "yes", NA),
         selection = ifelse(risk_1.x == 0, "no", selection)) %>%
  select(selection, ends_with(".freq"))
```

```
count_all
```

```
##   selection risk_1.freq risk_2.freq risk_3.freq risk_4.freq risk_5.freq
## 1        no         405         435         329         420         373
## 2       yes          53          23         129          38          85
## 3      <NA>          36          36          36          36          36
##   risk_6.freq risk_7.freq risk_8.freq risk_9.freq risk_10.freq
## 1         355         327         440         424          358
## 2         101         130          17          34          100
## 3          38          37          37          36           36
##   risk_11.freq risk_12.freq risk_13.freq risk_14.freq risk_15.freq
## 1          387          289          393          422          333
## 2           71          169           65           36          124
## 3           36           36           36           36           37
##   risk_16.freq risk_17.freq risk_18.freq risk_19.freq risk_20.freq
## 1          376          407          284          310          235
## 2           82           51          171          147          222
## 3           36           36           39           37           37
##   risk_21.freq risk_22.freq risk_23.freq risk_24.freq risk_25.freq
## 1          213          254          306          435          348
## 2          245          203          152           23          109
## 3           36           37           36           36           37
##   risk_26.freq risk_27.freq risk_28.freq risk_29.freq risk_30.freq
## 1          390          357          431          453          408
## 2           68          101           27            5           49
## 3           36           36           36           36           37
##   risk_31.freq risk_32.freq
## 1          256          264
## 2          202          194
## 3           36           36
```

Item corrlations

```
cor <- round(cor(sem_items, use = "pairwise.complete.obs") ,2)

upper<-cor
upper[upper.tri(cor)]<-""
upper<-as.data.frame(upper)


kable(upper, "html", full_width = T)
```

risk_1

risk_2

risk_3

risk_4

risk_5

risk_6

risk_7

risk_8

risk_9

risk_10

risk_11

risk_12

risk_13

risk_14

risk_15

risk_16

risk_17

risk_18

risk_19

risk_20

risk_21

risk_22

risk_23

risk_24

risk_25

risk_26

risk_27

risk_28

risk_29

risk_30

risk_31

risk_32

risk_1

1

risk_2

0.2

1

risk_3

0.02

0.19

1

risk_4

0.06

0.11

0.11

1

risk_5

0.04

0.1

0.19

0.08

1

risk_6

0.26

0.05

0.2

0.14

0.43

1

risk_7

0.2

0.05

0.27

0.13

0.31

0.52

1

risk_8

0

0.22

-0.07

0.02

0

0.01

-0.02

1

risk_9

0.05

0.16

-0.01

0.07

0.01

0.01

0.04

0.52

1

risk_10

-0.11

0.07

0.07

0.05

-0.05

-0.08

0.04

0.2

0.23

1

risk_11

-0.08

0.12

0.04

0.05

0

0

0.04

0.2

0.2

0.52

1

risk_12

0.16

0.07

0.08

0.16

0.28

0.32

0.27

-0.08

-0.04

0.02

0.17

1

risk_13

0.07

0.19

0.11

-0.01

0.02

0.07

0.08

0.35

0.24

0.21

0.22

0.09

1

risk_14

0.02

0.04

0.03

0.03

0.03

0.02

0.05

0.11

0.07

0.18

0.17

0.21

0.14

1
risk_15
0.08
0.15
0.07
0.03
0.04
-0.01
0.1
0.11
0.03
0.19
0.16
0.08
0.1
0.17
1
risk_16
-0.01
0.1
0.14
0.07
0
0.07
0.11
0.15
0.06
0.1
0.16
0.09
0.2
0.16
0.13
1
risk_17
0.09

0.11

0.26

0.17

0.13

0.16

0.22

0

-0.02

0.03

0.1

0.13

0.23

0.03

0.08

0.11

1

risk_18

0.14

0.02

0.12

0.08

0.05

0.15

0.24

0.12

0.05

0.17

0.25

0.14

0.08

0.02

0.03

0.03

0.21

1

risk_19

-0.01
0.08
0.09
0.05
0.04
0
-0.07
0.11
0.11
0.08
0.05
0.02
0.11
-0.03
-0.01
0.02
0.02
-0.01
1
risk_20
-0.02
0.04
0.07
0.08
-0.07
-0.01
-0.15
-0.08
0.01
-0.01
0.04
-0.01
0.03
0.02
0.04
0.12

0.02

-0.06

0.17

1

risk_21

-0.07

-0.03

0.05

0.06

0.04

0.07

0

-0.03

-0.07

-0.01

0.04

-0.1

0.05

-0.02

-0.02

-0.02

-0.03

0.06

-0.03

0.14

1

risk_22

-0.08

0.02

0.09

0.05

-0.03

0

-0.09

-0.01

0.05

-0.01
0.01
0.02
0.01
-0.07
0.01
0.03
0.03
-0.06
0.18
0.28
0.16
1
risk_23
-0.04
0.07
0.12
0.12
0.02
0.06
0.1
-0.04
-0.02
-0.04
0.11
0.03
0.02
0
0
0.02
0.09
0.06
-0.05
0.09
0.29
0.13

1
risk_24
0.1
-0.05
-0.03
0
0.04
0.17
0.03
-0.05
0.01
-0.07
-0.04
-0.05
-0.04
0.12
-0.05
-0.03
0.01
0.07
0.06
0.02
-0.03
-0.06
0.01
1
risk_25
-0.12
-0.01
-0.01
0.13
0.06
-0.01
0.03
-0.03
0.04

0.19
0.16
-0.04
0.12
0.03
0.04
-0.05
0.05
-0.05
-0.08
-0.08
0.2
0.02
0.24
-0.01
1
risk_26
-0.02
0.02
0
0.16
-0.01
-0.02
-0.06
0.02
0
0.05
0.08
-0.04
0.04
0.06
-0.01
0
0.05
-0.02
0.05

0.13

0.16

0.11

0.16

0.13

0.27

1

risk_27

-0.06

0.09

0.05

0.16

0.02

0

0.01

0.03

0.03

0.09

0.11

0.01

0.1

0.04

0.08

0.01

0.13

0.02

0.04

0.03

0.11

0.08

0.17

0

0.39

0.39

1

risk_28

-0.03
0.03
0.03
0.09
-0.05
-0.04
0.07
0.1
0.11
0.11
0.15
-0.02
0.11
0.03
0.2
0.03
0.12
0.06
0.09
0.03
0.12
0.07
0.2
-0.02
0.32
0.18
0.27
1
risk_29
-0.04
-0.02
-0.07
0.12
-0.05
-0.06
-0.02

-0.02
-0.03
0.1
0.01
0.01
-0.04
0.05
0.03
-0.05
0.03
-0.08
0.06
-0.02
0.1
0.08
0.06
-0.02
0.14
0.13
0.15
0.15
1
risk_30
-0.04
0.15
0.05
0.16
-0.02
0
0.02
-0.03
0.09
0.04
0.07
-0.04
-0.02

-0.02

0.11

-0.05

0.08

-0.02

0.08

0.12

0.15

0.19

0.03

0.02

0.14

0.33

0.14

0.24

0.1

1

risk_31

-0.01

0.02

0.06

0

-0.08

-0.08

-0.06

-0.03

0.05

0.08

0.02

-0.04

0.04

-0.05

0.15

0.11

-0.01

-0.01

0.11

0.23

0.15

0.24

0.17

0.02

0.12

0.12

0.08

0.17

0.08

0.15

1

risk_32

-0.02

0.11

0.02

0.03

-0.03

-0.04

-0.15

0.07

0.08

0.06

0.05

-0.04

0.09

-0.05

0.04

0.03

-0.02

-0.05

0.15

0.24

0.07

0.38

0.07

-0.1

0.11

0.13

0.17

0.09

0.08

0.13

0.32

1

```
#kable(upper, "html") %>%
#  kable_styling(full_width = T, position = "left") # <- nicer chart but only works whenknit to html.
```

Confirmatory Factor Analyses

Models

```
eco_risk <- "eco_risk  =~ risk_1 + risk_2 + risk_3 + risk_4 + risk_5 + risk_6 + risk_7"
fam_str  <- "fam_str   =~ risk_8 + risk_9 + risk_10 + risk_11 + risk_12 + risk_13 + risk_14 + risk_15 +
peer_dif <- "peer_dif  =~ risk_19 + risk_20"

aca_cha  <- "aca_cha   =~ risk_21 + risk_22 + risk_23"
prob_be  <- "prob_be   =~ risk_25 + risk_26 + risk_27 + risk_28  + risk_30  #+ risk_29"
men_he   <- "men_he    =~ risk_31 + risk_ 32"
```

Economic Risk

```
cfa <- cfa(eco_risk, data = sem_items)
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  56 iterations
##
##                                                   Used       Total
##   Number of observations                            456         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic                63.147
##   Degrees of freedom                                 14
##   P-value (Chi-square)                            0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic               381.559
##   Degrees of freedom                                 21
##   P-value                                         0.000
```

```
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.864
##   Tucker-Lewis Index (TLI)                       0.796
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1007.856
##   Loglikelihood unrestricted model (H1)       -976.282
##
##   Number of free parameters                         14
##   Akaike (AIC)                                2043.712
##   Bayesian (BIC)                              2101.427
##   Sample-size adjusted Bayesian (BIC)         2056.995
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.088
##   90 Percent Confidence Interval          0.066  0.110
##   P-value RMSEA <= 0.05                          0.002
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.058
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   eco_risk =~
##     risk_1            1.000
##     risk_2            0.305    0.143    2.127    0.033
##     risk_3            1.609    0.397    4.049    0.000
##     risk_4            0.603    0.199    3.026    0.002
##     risk_5            2.202    0.460    4.783    0.000
##     risk_6            3.715    0.737    5.038    0.000
##     risk_7            3.322    0.660    5.034    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_1            0.093    0.006   14.673    0.000
##    .risk_2            0.047    0.003   15.023    0.000
##    .risk_3            0.182    0.013   14.532    0.000
##    .risk_4            0.074    0.005   14.906    0.000
##    .risk_5            0.112    0.008   13.239    0.000
##    .risk_6            0.063    0.011    5.934    0.000
##    .risk_7            0.115    0.011   10.355    0.000
##     eco_risk          0.008    0.003    2.641    0.008
```

```
rm(cfa)
```

Family structure

```
cfa <- cfa(fam_str, data = sem_items)
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  93 iterations
##
##                                                   Used       Total
##   Number of observations                            453         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic               250.687
##   Degrees of freedom                                 44
##   P-value (Chi-square)                            0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic               572.744
##   Degrees of freedom                                 55
##   P-value                                         0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                     0.601
##   Tucker-Lewis Index (TLI)                        0.501
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1556.172
##   Loglikelihood unrestricted model (H1)      -1430.828
##
##   Number of free parameters                         22
##   Akaike (AIC)                                3156.344
##   Bayesian (BIC)                              3246.893
##   Sample-size adjusted Bayesian (BIC)         3177.073
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.102
##   90 Percent Confidence Interval          0.090  0.114
##   P-value RMSEA <= 0.05                          0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.080
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
```

```
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)
##   fam_str =~
##     risk_8           1.000
##     risk_9           1.369    0.281    4.864    0.000
##     risk_10          3.919    0.629    6.230    0.000
##     risk_11          3.680    0.584    6.302    0.000
##     risk_12          1.402    0.449    3.126    0.002
##     risk_13          2.076    0.398    5.211    0.000
##     risk_14          0.935    0.255    3.674    0.000
##     risk_15          1.587    0.429    3.704    0.000
##     risk_16          1.280    0.362    3.530    0.000
##     risk_17          0.894    0.292    3.058    0.002
##     risk_18          2.260    0.506    4.469    0.000
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)
##    .risk_8           0.026    0.002   13.941    0.000
##    .risk_9           0.057    0.004   14.128    0.000
##    .risk_10          0.102    0.010   10.594    0.000
##    .risk_11          0.070    0.007    9.386    0.000
##    .risk_12          0.225    0.015   14.805    0.000
##    .risk_13          0.099    0.007   13.816    0.000
##    .risk_14          0.066    0.004   14.676    0.000
##    .risk_15          0.185    0.013   14.667    0.000
##    .risk_16          0.137    0.009   14.714    0.000
##    .risk_17          0.096    0.007   14.818    0.000
##    .risk_18          0.212    0.015   14.371    0.000
##     fam_str          0.004    0.001    3.513    0.000
```

```
rm(cfa)
```

Peer difficulties

```
cfa <- cfa(peer_dif, data = sem_items)
```

```
## Warning in lav_model_vcov(lavmodel = lavmodel, lavsamplestats = lavsamplestats, : lavaan WARNING: co
##   lavaan NOTE: this may be a symptom that the model is not identified.
```

```
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  12 iterations
##
##                                                   Used       Total
##   Number of observations                            456         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic                    NA
##   Degrees of freedom                                 -1
##   Minimum Function Value               0.0000000000000
##
## User model versus baseline model:
##
```

```
##   Comparative Fit Index (CFI)                    NA
##   Tucker-Lewis Index (TLI)                       NA
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -623.613
##   Loglikelihood unrestricted model (H1)      -623.613
##
##   Number of free parameters                         4
##   Akaike (AIC)                               1255.226
##   Bayesian (BIC)                             1271.716
##   Sample-size adjusted Bayesian (BIC)        1259.022
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          NA
##   90 Percent Confidence Interval             NA     NA
##   P-value RMSEA <= 0.05                          NA
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                        0.000
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   peer_dif =~
##     risk_19           1.000
##     risk_20           0.256       NA
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_19           0.064       NA
##    .risk_20           0.240       NA
##     peer_dif          0.154       NA
```

```
rm(cfa)
```

Academic Challenges

```
cfa <- cfa(aca_cha, data = sem_items)
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  23 iterations
##
##                                                   Used       Total
##   Number of observations                           457         494
##
##   Estimator                                         ML
```

```
##   Minimum Function Test Statistic                0.000
##   Degrees of freedom                                 0
##
## Model test baseline model:
##
##   Minimum Function Test Statistic               56.524
##   Degrees of freedom                                 3
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    1.000
##   Tucker-Lewis Index (TLI)                       1.000
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)               -935.716
##   Loglikelihood unrestricted model (H1)       -935.716
##
##   Number of free parameters                          6
##   Akaike (AIC)                                1883.432
##   Bayesian (BIC)                              1908.181
##   Sample-size adjusted Bayesian (BIC)         1889.138
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000
##   90 Percent Confidence Interval          0.000  0.000
##   P-value RMSEA <= 0.05                             NA
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.000
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   aca_cha =~
##     risk_21           1.000
##     risk_22           0.423    0.161    2.631    0.009
##     risk_23           0.765    0.308    2.484    0.013
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_21           0.158    0.038    4.125    0.000
##    .risk_22           0.231    0.017   13.875    0.000
##    .risk_23           0.169    0.024    6.949    0.000
##     aca_cha           0.091    0.039    2.338    0.019
```

```
rm(cfa)
```

Problem Behavior

```
cfa <- cfa(prob_be, data = sem_items)
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  31 iterations
##
##                                                   Used       Total
##   Number of observations                            456         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic                41.923
##   Degrees of freedom                                  5
##   P-value (Chi-square)                            0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic               293.209
##   Degrees of freedom                                 10
##   P-value                                         0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                     0.870
##   Tucker-Lewis Index (TLI)                        0.739
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)                -656.581
##   Loglikelihood unrestricted model (H1)        -635.620
##
##   Number of free parameters                          10
##   Akaike (AIC)                                1333.162
##   Bayesian (BIC)                              1374.387
##   Sample-size adjusted Bayesian (BIC)         1342.650
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.127
##   90 Percent Confidence Interval          0.093  0.164
##   P-value RMSEA <= 0.05                          0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.057
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
```

```
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   prob_be =~
##     risk_25           1.000
##     risk_26           0.823    0.110    7.472    0.000
##     risk_27           1.090    0.141    7.748    0.000
##     risk_28           0.442    0.067    6.623    0.000
##     risk_30           0.458    0.082    5.578    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_25           0.123    0.011   11.358    0.000
##    .risk_26           0.087    0.008   11.523    0.000
##    .risk_27           0.102    0.010    9.771    0.000
##    .risk_28           0.044    0.003   13.114    0.000
##    .risk_30           0.084    0.006   13.984    0.000
##     prob_be           0.059    0.011    5.176    0.000
```

```
rm(cfa)
```

Mental Health Challenges

```
cfa <- cfa(men_he, data = sem_items)
```

```
## Warning in lav_model_vcov(lavmodel = lavmodel, lavsamplestats = lavsamplestats, : lavaan WARNING: co
##   lavaan NOTE: this may be a symptom that the model is not identified.
```

```
summary(cfa, fit.measures = TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after  11 iterations
##
##                                                   Used       Total
##   Number of observations                            458         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic                    NA
##   Degrees of freedom                                 -1
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                        NA
##   Tucker-Lewis Index (TLI)                           NA
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)               -632.217
##   Loglikelihood unrestricted model (H1)       -632.217
##
##   Number of free parameters                          4
##   Akaike (AIC)                               1272.433
##   Bayesian (BIC)                             1288.941
##   Sample-size adjusted Bayesian (BIC)        1276.246
##
```

```
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          NA
##   90 Percent Confidence Interval             NA     NA
##   P-value RMSEA <= 0.05                          NA
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                        0.000
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   men_he =~
##     risk_31           1.000
##     risk_32           0.395       NA
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_31           0.051       NA
##    .risk_32           0.214       NA
##     men_he            0.196       NA
```

```
rm(cfa)
```

SEM

Models

Current problems with model convergence when idnetifying the overall environmental & individual risk factors scale. I will also take all items loaded onto the environmental & individual risk factors scale. This will be model 2.

```
model1 <- "
       #Environmental risk factors
          eco_risk  =~ risk_1 + risk_2 + risk_3 + risk_4 + risk_5 + risk_6 + risk_7
          fam_str   =~ risk_8 + risk_9 + risk_10 + risk_11 + risk_12 + risk_13 + risk_14 + risk_15 + ris
          peer_dif  =~ risk_19 + risk_20

        #Individual Risk factors
          aca_cha   =~ risk_21 + risk_22 + risk_23                        #+risk_24
          prob_be   =~ risk_25 + risk_26 + risk_27 + risk_28  + risk_30   #+ risk_29
          men_he    =~ risk_31 + risk_ 32

        #env_risk =~ eco_risk + fam_str + peer_dif
        #ind_risk =~ aca_cha + prob_be + men_he

        #risk =~ env_risk + ind_risk
"
```

```
model2 <- "
       #Environmental risk factors
          env_risk =~ risk_1 + risk_2 + risk_3 + risk_4 + risk_5 + risk_6 + risk_7 +
          risk_8 + risk_9 + risk_10 + risk_11 + risk_12 + risk_13 + risk_14 + risk_15 + risk_16 + risk_
          risk_19 + risk_20


        #Individual Risk factors
         ind_risk   =~ risk_21 + risk_22 + risk_23 +                          #+risk_24
          risk_25 + risk_26 + risk_27 + risk_28  + risk_30 +   #+ risk_29
          risk_31 + risk_ 32

       # risk =~ env_risk + ind_risk
"
```

Fit Model 1

```
fit <-sem(model1, sem_items)
summary(fit, fit.measures =TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after 272 iterations
##
##                                                   Used       Total
##   Number of observations                            450         494
##
##   Estimator                                          ML
##   Minimum Function Test Statistic              1053.146
##   Degrees of freedom                                390
##   P-value (Chi-square)                            0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic              2235.313
##   Degrees of freedom                                435
##   P-value                                         0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                     0.632
##   Tucker-Lewis Index (TLI)                        0.589
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -5241.215
##   Loglikelihood unrestricted model (H1)      -4714.642
##
##   Number of free parameters                         75
##   Akaike (AIC)                               10632.431
##   Bayesian (BIC)                             10940.624
##   Sample-size adjusted Bayesian (BIC)        10702.603
##
## Root Mean Square Error of Approximation:
```

```
##
##   RMSEA                                          0.061
##   90 Percent Confidence Interval          0.057  0.066
##   P-value RMSEA <= 0.05                          0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.071
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)
##   eco_risk =~
##     risk_1           1.000
##     risk_2           0.384    0.152    2.528    0.011
##     risk_3           1.735    0.436    3.981    0.000
##     risk_4           0.681    0.215    3.174    0.002
##     risk_5           2.258    0.495    4.565    0.000
##     risk_6           3.679    0.761    4.832    0.000
##     risk_7           3.572    0.741    4.819    0.000
##   fam_str =~
##     risk_8           1.000
##     risk_9           1.402    0.288    4.864    0.000
##     risk_10          3.777    0.619    6.102    0.000
##     risk_11          3.581    0.576    6.215    0.000
##     risk_12          1.564    0.462    3.383    0.001
##     risk_13          2.225    0.418    5.324    0.000
##     risk_14          0.979    0.261    3.752    0.000
##     risk_15          1.734    0.443    3.915    0.000
##     risk_16          1.362    0.372    3.657    0.000
##     risk_17          1.090    0.307    3.545    0.000
##     risk_18          2.279    0.513    4.445    0.000
##   peer_dif =~
##     risk_19          1.000
##     risk_20          2.292    0.684    3.353    0.001
##   aca_cha =~
##     risk_21          1.000
##     risk_22          1.440    0.275    5.227    0.000
##     risk_23          0.926    0.208    4.449    0.000
##   prob_be =~
##     risk_25          1.000
##     risk_26          0.772    0.103    7.462    0.000
##     risk_27          1.017    0.129    7.912    0.000
##     risk_28          0.452    0.065    6.956    0.000
##     risk_30          0.488    0.082    5.976    0.000
##   men_he =~
##     risk_31          1.000
##     risk_32          1.074    0.155    6.942    0.000
##
## Covariances:
```

```
##                    Estimate  Std.Err  z-value  P(>|z|)
##   eco_risk ~~
##     fam_str           0.001    0.000    2.399    0.016
##     peer_dif         -0.001    0.001   -1.123    0.262
##     aca_cha           0.001    0.001    0.822    0.411
##     prob_be           0.000    0.001    0.270    0.787
##     men_he           -0.003    0.002   -1.733    0.083
##   fam_str ~~
##     peer_dif          0.001    0.001    1.351    0.177
##     aca_cha           0.001    0.001    0.766    0.444
##     prob_be           0.005    0.001    3.467    0.001
##     men_he            0.002    0.001    1.581    0.114
##   peer_dif ~~
##     aca_cha           0.016    0.006    2.912    0.004
##     prob_be           0.004    0.003    1.390    0.164
##     men_he            0.025    0.008    3.199    0.001
##   aca_cha ~~
##     prob_be           0.024    0.006    4.188    0.000
##     men_he            0.042    0.009    4.772    0.000
##   prob_be ~~
##     men_he            0.030    0.007    4.509    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .risk_1            0.095    0.006   14.591    0.000
##    .risk_2            0.043    0.003   14.869    0.000
##    .risk_3            0.182    0.013   14.354    0.000
##    .risk_4            0.070    0.005   14.744    0.000
##    .risk_5            0.114    0.009   13.192    0.000
##    .risk_6            0.073    0.010    7.246    0.000
##    .risk_7            0.109    0.011    9.721    0.000
##    .risk_8            0.026    0.002   13.930    0.000
##    .risk_9            0.058    0.004   14.058    0.000
##    .risk_10           0.108    0.010   11.238    0.000
##    .risk_11           0.073    0.007   10.055    0.000
##    .risk_12           0.222    0.015   14.698    0.000
##    .risk_13           0.097    0.007   13.590    0.000
##    .risk_14           0.066    0.005   14.600    0.000
##    .risk_15           0.183    0.013   14.548    0.000
##    .risk_16           0.137    0.009   14.628    0.000
##    .risk_17           0.095    0.007   14.658    0.000
##    .risk_18           0.212    0.015   14.324    0.000
##    .risk_19           0.202    0.014   13.929    0.000
##    .risk_20           0.165    0.030    5.462    0.000
##    .risk_21           0.217    0.016   13.591    0.000
##    .risk_22           0.181    0.017   10.674    0.000
##    .risk_23           0.193    0.014   13.650    0.000
##    .risk_25           0.122    0.011   11.514    0.000
##    .risk_26           0.091    0.007   12.218    0.000
##    .risk_27           0.111    0.010   11.015    0.000
##    .risk_28           0.042    0.003   12.961    0.000
##    .risk_30           0.083    0.006   13.792    0.000
##    .risk_31           0.174    0.016   11.102    0.000
##    .risk_32           0.160    0.016    9.897    0.000
```

```
##     eco_risk          0.007    0.003    2.516    0.012
##     fam_str           0.004    0.001    3.467    0.001
##     peer_dif          0.016    0.008    2.099    0.036
##     aca_cha           0.032    0.011    3.034    0.002
##     prob_be           0.060    0.011    5.325    0.000
##     men_he            0.072    0.016    4.593    0.000
```

Fit model 2

```
fit2 <-sem(model2, sem_items)
summary(fit2, fit.measures =TRUE)
```

```
## lavaan (0.5-23.1097) converged normally after 155 iterations
##
##                                                   Used       Total
##   Number of observations                           450         494
##
##   Estimator                                         ML
##   Minimum Function Test Statistic             1372.673
##   Degrees of freedom                               404
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             2235.313
##   Degrees of freedom                               435
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.462
##   Tucker-Lewis Index (TLI)                       0.421
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -5400.979
##   Loglikelihood unrestricted model (H1)      -4714.642
##
##   Number of free parameters                         61
##   Akaike (AIC)                               10923.958
##   Bayesian (BIC)                             11174.622
##   Sample-size adjusted Bayesian (BIC)        10981.031
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.073
##   90 Percent Confidence Interval          0.069  0.077
##   P-value RMSEA <= 0.05                          0.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.082
##
```

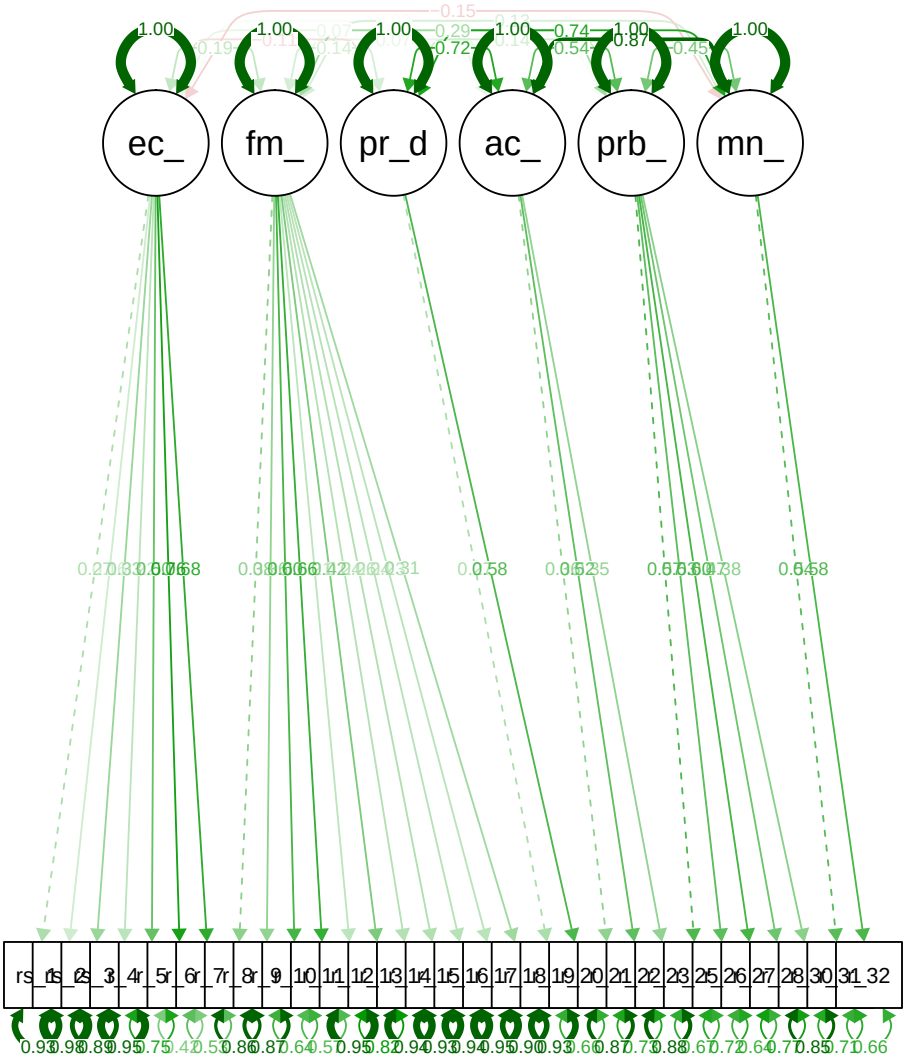
```
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)
##   env_risk =~
##     risk_1           1.000
##     risk_2           0.543    0.165    3.288    0.001
##     risk_3           1.943    0.457    4.249    0.000
##     risk_4           0.810    0.226    3.587    0.000
##     risk_5           2.031    0.449    4.529    0.000
##     risk_6           3.052    0.626    4.875    0.000
##     risk_7           3.392    0.693    4.892    0.000
##     risk_8           0.213    0.115    1.858    0.063
##     risk_9           0.352    0.172    2.042    0.041
##     risk_10          0.586    0.277    2.111    0.035
##     risk_11          0.844    0.272    3.103    0.002
##     risk_12          2.493    0.552    4.517    0.000
##     risk_13          0.980    0.281    3.488    0.000
##     risk_14          0.465    0.185    2.507    0.012
##     risk_15          0.819    0.314    2.610    0.009
##     risk_16          0.869    0.286    3.038    0.002
##     risk_17          1.346    0.318    4.229    0.000
##     risk_18          1.766    0.445    3.972    0.000
##     risk_19          0.233    0.293    0.796    0.426
##     risk_20         -0.218    0.313   -0.697    0.486
##   ind_risk =~
##     risk_21          1.000
##     risk_22          0.855    0.207    4.137    0.000
##     risk_23          1.030    0.217    4.740    0.000
##     risk_25          1.315    0.242    5.440    0.000
##     risk_26          1.073    0.199    5.402    0.000
##     risk_27          1.301    0.238    5.467    0.000
##     risk_28          0.617    0.120    5.154    0.000
##     risk_30          0.717    0.148    4.852    0.000
##     risk_31          1.025    0.223    4.597    0.000
##     risk_32          1.011    0.221    4.576    0.000
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)
##   env_risk ~~
##     ind_risk         0.001    0.001    1.217    0.224
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)
##    .risk_1            0.094    0.006   14.577    0.000
##    .risk_2            0.042    0.003   14.721    0.000
##    .risk_3            0.175    0.012   14.137    0.000
##    .risk_4            0.069    0.005   14.618    0.000
##    .risk_5            0.120    0.009   13.614    0.000
##    .risk_6            0.102    0.009   11.273    0.000
##    .risk_7            0.115    0.011   10.938    0.000
```

```
##    .risk_8           0.030    0.002   14.939    0.000
##    .risk_9           0.065    0.004   14.924    0.000
##    .risk_10          0.166    0.011   14.918    0.000
##    .risk_11          0.123    0.008   14.769    0.000
##    .risk_12          0.185    0.014   13.645    0.000
##    .risk_13          0.111    0.008   14.656    0.000
##    .risk_14          0.068    0.005   14.874    0.000
##    .risk_15          0.190    0.013   14.860    0.000
##    .risk_16          0.139    0.009   14.783    0.000
##    .risk_17          0.086    0.006   14.161    0.000
##    .risk_18          0.210    0.015   14.405    0.000
##    .risk_19          0.217    0.014   14.990    0.000
##    .risk_20          0.250    0.017   14.992    0.000
##    .risk_21          0.219    0.016   14.117    0.000
##    .risk_22          0.225    0.016   14.373    0.000
##    .risk_23          0.189    0.014   13.912    0.000
##    .risk_25          0.131    0.011   12.425    0.000
##    .risk_26          0.093    0.007   12.576    0.000
##    .risk_27          0.123    0.010   12.308    0.000
##    .risk_28          0.043    0.003   13.284    0.000
##    .risk_30          0.082    0.006   13.780    0.000
##    .risk_31          0.215    0.015   14.053    0.000
##    .risk_32          0.213    0.015   14.072    0.000
##     env_risk         0.008    0.003    2.567    0.010
##     ind_risk         0.030    0.009    3.142    0.002
```

Diagrams

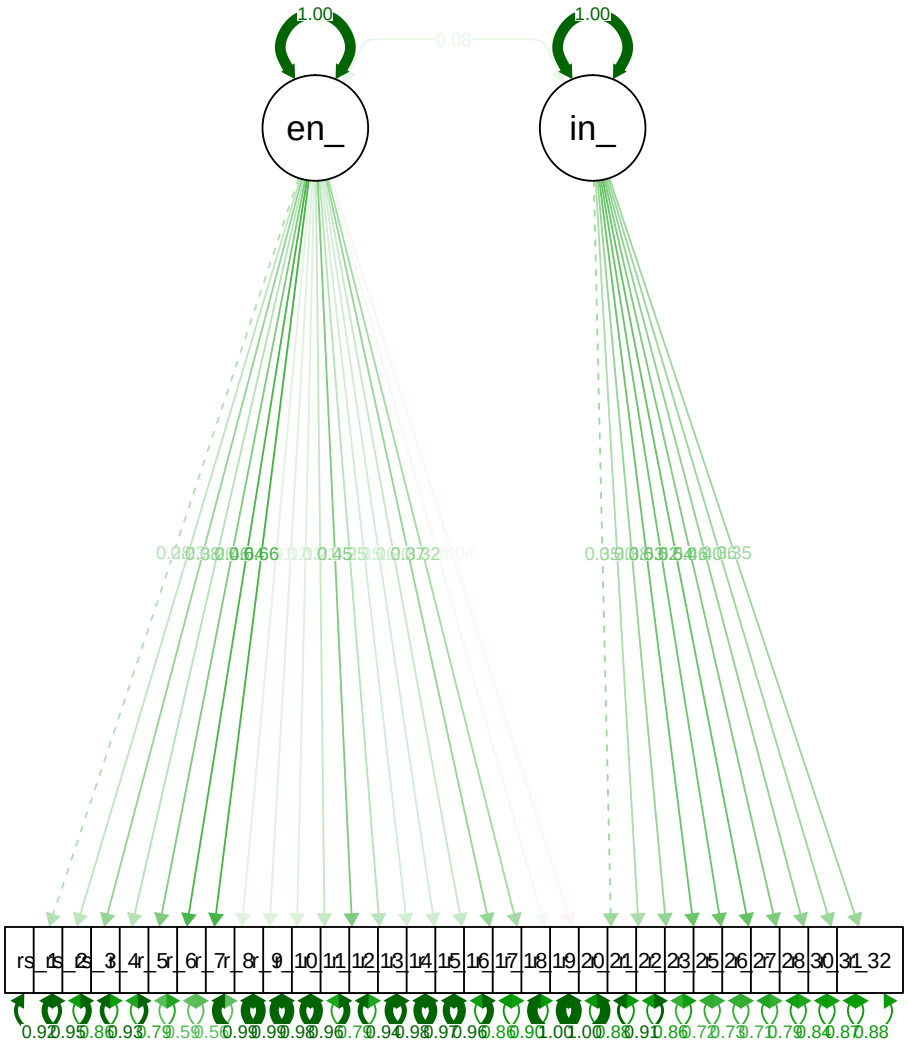
Model 1

```r
semPaths(fit, "std", title = FALSE, curvePivot = TRUE)
```



##Model 2

```
semPaths(fit2, "std", title = FALSE, curvePivot = TRUE)
```


1.00
0.08
1.00
en_
in_