An?lises Fatoriais Confirmatorias - AFC

April 27, 2020

```
In [2]: library("tidyverse")
        library("reshape2")
        library("ggfortify")
        library("ltm")
        library(lavaan)
        library(psych)
```

1 Ler "dados.csv"

```
In [4]: dados = read.csv("dados.csv", header = TRUE)
        levels(dados$Escola) = c("Escola A", "Escola B")
        dados$Série = factor(dados$Série, levels = c(6, 7, 8, 9, 1))
        levels(dados$Série) = paste0(levels(dados$Série), "ž ano")
        dados$Turma = factor(paste(dados$Série, str_to_upper(as.character(dados$Turma))),
                             levels = c("6ž ano A", "6ž ano B","7ž ano A","7ž ano B","7ž ano C"
                                        "7ž ano E","8ž ano A","8ž ano C","9ž ano B","9ž ano C"
                                        "1ž ano A","1ž ano B"))
```

2 Ler "pontuacoes.csv"

```
In [5]: pontuacoes = read.csv("pontuacoes.csv", header = TRUE)
        pontuacoes$Total = apply(pontuacoes[,2:26], 1, sum)
        pontuacoes$Grau = factor(ceiling(pontuacoes$Total/25), levels = c(1, 2, 3, 4, 5))
        levels(pontuacoes$Grau) = c("Nenhuma Ansiedade",
                                    "Baixa Ansiedade",
                                    "Ansiedade Moderada",
                                    "Alta Ansiedade",
                                    "Extrema Ansiedade")
```

3 Unir dados "pontuacoes" e "dados" por nome

```
In [7]: dados = left_join(dados, pontuacoes) %>%
          filter(!is.na(X1))
        n_meninos = sum(dados$Gênero == "M" & !is.na(dados$X1))
        n_meninas = sum(dados$Gênero == "F" & !is.na(dados$X1))
```

```
Joining, by = c("Nomes", "X1", "X2", "X3", "X4", "X5", "X6", "X7", "X8", "X9", "X10", "X11", "X
Warning message:
Column `Nomes` joining character vector and factor, coercing into character vector
```

4 Estudo de teste KMO e Bartlett

```
In [8]: M2 = as.matrix(dados[8:32])
```

4.1 KMO

```
In [9]: KMO(M2)
```

```
Kaiser-Meyer-Olkin factor adequacy
Call: KMO(r = M2)
Overall MSA =  0.76
MSA for each item =
  X1   X2   X3   X4   X5   X6   X7   X8   X9  X10  X11  X12  X13  X14  X15  X16
0.71 0.75 0.72 0.84 0.66 0.83 0.47 0.72 0.44 0.73 0.83 0.80 0.85 0.67 0.76 0.88
 X17  X18  X19  X20  X21  X22  X23  X24  X25
0.73 0.65 0.72 0.79 0.80 0.86 0.80 0.65 0.70
```

4.2 Bartlet

```
In [10]: cortest.bartlett(M2)
```

```
R was not square, finding R from data
```

$chisq 798.334619278655

$p.value 6.87119867053906e-47

$df 300

5 Estudos AFC

```
In [11]: modelo= 'F1 =~ X7 + X8 + X13 + X15 + X17 + X18 + X21 + X22 + X24 + X25
                  F2 =~ X1 + X2 + X4 + X5 + X6 + X9 + X10 + X14 + X16 + X20 + X23'
         cfa1= cfa(modelo, data=dados)
         summary(cfa1, standardized=FALSE, fit.measures=TRUE)
```

```
lavaan 0.6-5 ended normally after 101 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
```

```
  Number of free parameters                         43

  Number of observations                            73

Model Test User Model:

  Test statistic                               340.668
  Degrees of freedom                               188
  P-value (Chi-square)                           0.000

Model Test Baseline Model:

  Test statistic                               705.148
  Degrees of freedom                               210
  P-value                                        0.000

User Model versus Baseline Model:

  Comparative Fit Index (CFI)                    0.692
  Tucker-Lewis Index (TLI)                       0.656

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -1993.197
  Loglikelihood unrestricted model (H1)      -1822.863

  Akaike (AIC)                                4072.395
  Bayesian (BIC)                              4170.885
  Sample-size adjusted Bayesian (BIC)         4035.391

Root Mean Square Error of Approximation:

  RMSEA                                          0.105
  90 Percent confidence interval - lower         0.087
  90 Percent confidence interval - upper         0.123
  P-value RMSEA <= 0.05                          0.000

Standardized Root Mean Square Residual:

  SRMR                                           0.099

Parameter Estimates:

  Information                                 Expected
  Information saturated (h1) model          Structured
  Standard errors                             Standard

Latent Variables:
```

```
                   Estimate  Std.Err  z-value  P(>|z|)
  F1 =~
    X7                1.000
    X8                4.352    3.137    1.388    0.165
    X13               4.084    2.874    1.421    0.155
    X15               4.175    3.034    1.376    0.169
    X17               5.390    3.827    1.408    0.159
    X18               2.016    1.513    1.332    0.183
    X21               5.675    3.999    1.419    0.156
    X22               5.042    3.555    1.418    0.156
    X24               3.731    2.760    1.352    0.176
    X25               3.691    2.713    1.361    0.174
  F2 =~
    X1                1.000
    X2                1.498    0.548    2.737    0.006
    X4                2.433    0.787    3.091    0.002
    X5                1.452    0.562    2.583    0.010
    X6                2.560    0.842    3.039    0.002
    X9                0.407    0.357    1.140    0.254
    X10               1.812    0.649    2.790    0.005
    X14               1.175    0.457    2.570    0.010
    X16               2.821    0.889    3.172    0.002
    X20               2.524    0.848    2.976    0.003
    X23               1.972    0.637    3.098    0.002

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)
  F1 ~~
    F2                0.037    0.028    1.295    0.195

Variances:
                   Estimate  Std.Err  z-value  P(>|z|)
   .X7                0.606    0.101    6.011    0.000
   .X8                0.993    0.175    5.682    0.000
   .X13               0.359    0.070    5.155    0.000
   .X15               1.109    0.193    5.745    0.000
   .X17               0.957    0.175    5.467    0.000
   .X18               0.441    0.075    5.868    0.000
   .X21               0.750    0.144    5.224    0.000
   .X22               0.611    0.116    5.250    0.000
   .X24               1.225    0.210    5.828    0.000
   .X25               1.076    0.185    5.803    0.000
   .X1                0.483    0.082    5.890    0.000
   .X2                0.603    0.104    5.767    0.000
   .X4                0.615    0.115    5.329    0.000
   .X5                0.763    0.131    5.838    0.000
   .X6                0.816    0.150    5.448    0.000
   .X9                0.643    0.107    6.023    0.000
```

```
   .X10              0.787    0.137    5.735    0.000
   .X14              0.511    0.088    5.843    0.000
   .X16              0.585    0.116    5.031    0.000
   .X20              0.964    0.174    5.554    0.000
   .X23              0.394    0.074    5.311    0.000
    F1               0.020    0.028    0.719    0.472
    F2               0.088    0.054    1.645    0.100
```

6 Cronbach alpha

```
In [12]: questoes = 8:32
         cronbach.alpha(as.matrix(dados[,questoes]), CI = TRUE)
```

```

Cronbach's alpha for the 'as.matrix(dados[, questoes])' data-set

Items: 25
Sample units: 73
alpha: 0.897

Bootstrap 95% CI based on 1000 samples
 2.5% 97.5%
0.858 0.924
```