PSYn5440 – Introduction to Factor Analysis

Homework assignment 3, Fall 2021

Due midnight, January 10th, 2022

The Big Five theory of personality is a well-known and widely studied personality model in psychology. The Big Five factors are usually known as *Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness*. For a sample of N = 1000 individuals, data were obtained using a Big Five measure and the correlation matrix of the items was calculated (you can find it in IS as **BigFive.csv**). The measure consisted of 30 items, with six items for each of the Big Five factors. For abbreviation, the items are labeled as N1-N6 (Neuroticism), E1-E6 (Extraversion), O1-O6 (Openness), A1-A6 (Agreeableness), and C1-C6 (Conscientiousness), using the row above the correlation matrix.

You can use any software you wish to work on this assignment, however, I strongly suggest R (Rstudio) and the *lavaan* package. In the example script I have supplied for the class (it's in IS – **Script_lavaan.R**) you should be able to find ways to answer every part of the assignment. Either way, attach the script file you have used to your submitted assignment and, in case you did not use R, attach the output as well.

Part 1

Fit a 5-factor model reflecting the Big Five structure (see above) with correlated factors. Use the correlation matrix provided and fit the model using Maximum Likelihood estimation. Use the variables names and factor names given above.

After fitting the model, output all parameter matrices with the parameter estimates.

Complete this part by showing the required code in the script file (mark the code with „Part 1") which you will submit with your assignment.

Part 2

Inspect the outputted parameter matrices and the model summary() and try to get your head around the results. Then, report and write a brief interpretation of the following:

a) Residual correlations (if working in R, you don't have to report them here, but show how would you obtain them in the input file you will be submitting)

b) Test of perfect fit

c) RMSEA and its 90% confidence interval

d) TLI

Next, use a χ^2 difference test to test the hypothesis that the factors are orthogonal (uncorrelated) – you will need to fit another model. Report **all** the χ^2 values and degree-of-freedom values involved (for the two models **and** thir difference), as well as the resulting p-value. Briefly interpret the result. Also, briefly explain why is it permissible to use a χ^2 difference test in this case (i.e., why are the two models nested).

Finally, write a brief evaluation of the estimates – discuss / summarize the factor loadings per factor and overall, and interpret the factor correlations. Show me you understand what all the model estimates represent from the model perspective. Basically, using your interpretation of the model parameters, the residual correlations, model fit information and the χ^2 difference test, write up a short (you can really be concise, half a page tops) summary – you can follow the great guide attached in IS (**reporting_CFA.html**), just look up the „Example write-up" section and find the paragraph under the path diagram. That's roughly what I'd like to see (form-wise). You don't have to bother with creating any tables, just supply the code you used and refer to what the code produces in your text.

Extra Credit (optional)

For the same correlation matrix, I have fit a 5-factor exploratory factor analysis in CEFA using Maximum Likelihood estimation and conducted an oblique target rotation (see the last slides in the Rotation lecture) using the Big Five factor pattern as the hypothesized target (you can find the output in **Homework3_CEFA.out**). Comment on the difference in goodness of fit between my exploratory model and the confirmatory model you fit in Part 1. Would you be able to compare the two models using a χ^2 difference test? Why or why not?