This homework assignment is due by 4:00 pm on Friday, December 3. It should be placed in the instructor’s mailbox by that time. Include all relevant computer printouts, clearly labeled.

This assignment involves factor analyses for a study of the factor structure underlying the NEO-PI personality inventory, which purports to measure the Big Five personality factors. The full inventory is comprised of 240 items, which are designed to measure 30 personality facets. According to the Big Five model, these 30 facets are influenced by five major personality factors: Neuroticism, Extroversion, Openness to Experience, Agreeableness, and Conscientiousness. For each of these factors, there are six facets serving as indicators, as follows:

Neuroticism:
- N1: Anxiety
- N2: Angry Hostility
- N3: Depression
- N4: Self-Consciousness
- N5: Impulsiveness
- N6: Vulnerability

Extroversion:
- E1: Warmth
- E2: Gregariousness
- E3: Assertiveness
- E4: Activity
- E5: Excitement-Seeking
- E6: Positive Emotions

Openness to Experience:
- O1: Fantasy
- O2: Aesthetics
- O3: Feelings
- O4: Actions
- O5: Ideas
- O6: Values

Agreeableness:
- A1: Trust
- A2: Straightforwardness
- A3: Altruism
- A4: Compliance
- A5: Modesty
- A6: Tender-Mindedness
Conscientiousness:
   C1: Competence
   C2: Order
   C3: Dutifulness
   C4: Achievement Striving
   C5: Self-Discipline
   C6: Deliberation

You will be provided with a data file containing a correlation matrix for these 30 facets. The matrix is based on data from a normative sample of N=1,000 people. This homework assignment involves evaluating the degree to which the Big Five model, when represented as a restricted factor analysis model, accounts for the correlations among the 30 facets. The Big Five model can be viewed as an hypothesis that there are five correlated factors, with each factor influencing 6 measured variables (facets) as indicated in the list above. All other loadings are hypothesized to be zero, and each measured variable is assumed to be influenced by a corresponding unique factor.

1. Set up the 3 parameter matrices representing this hypothesized model. Label each matrix with its appropriate Greek symbol, and label the rows and columns of each matrix using the variable name abbreviations and factor names given above. Show the elements of each matrix. For each element, represent the free parameters with appropriate mathematical notation and give the numerical values of the fixed elements.

2. Draw a complete path diagram representing all aspects of the model. Use the names and symbols from #1 to represent variables and paths.

3. Use LISREL to fit the hypothesized model to the correlation matrix by maximum likelihood. Use the variable and factor names given above.

4. Using the results obtained from LISREL, set up the parameter matrices again as in #1, but now using numerical values of parameter estimates instead of Greek symbols.

5. Write a brief evaluation of the parameter estimates, referring to the estimates and their statistical significance. Briefly discuss (a) factor loadings (b) factor intercorrelations, and (c) unique variances.

6. Use LISREL to fit a zero-factor model (null model) to the data. Using these results and the results from #3, calculate the Tucker-Lewis (Bentler-Bonett Non-Normed) fit index for the model under study.

7. Report and write a brief interpretation of each of the following pieces of information:

   (a) Residual correlations.
   (b) Test of exact fit.
   (c) Test of close fit.
   (d) RMSEA and its confidence interval.
   (e) Bentler-Bonett NNFI
8. Use a difference test to test the null hypothesis that $\Phi = I$ (i.e., the factors are orthogonal). This will require carrying out another LISREL analysis. Provide the listing of the input file and the resulting measures of fit of the model. For the test of the difference between models, show the calculation of the test statistic and degrees of freedom and write a brief interpretation of your result.

**Extra Credit:** (worth an increment of up to 3% to your overall homework score for the semester).

EC1) There are debates in the literature about whether the Big Five model is appropriately evaluated using a confirmatory factor analysis approach. If you are interested in reading about this issue, see the references below. (Copies of these papers are provided at the Psychology 236 website. However, it is not necessary to read these papers in order to carry out the analyses and address the questions in this assignment.) To further evaluate the adequacy of the Big Five model for the data provided here, carry out an exploratory factor analysis using CEFA, retaining five factors and conducting an oblique target rotation, where the target matrix represents the Big Five factors described above. Test the difference between this model and the confirmatory factor analysis model specified above (note that the confirmatory model is nested in the exploratory model), and write a brief interpretation of your result. Examine the rotated factor loading matrix you obtain and write a brief interpretation with respect to the degree to which the Big Five model is supported.

EC2) Use LISREL to conduct an unrestricted factor analysis on the same data by imposing a minimal set of constraints on the solution. Show that you obtain the same discrepancy function value and chi-square test of fit as you obtained from CEFA.

References:
