Name ________________________

Psychology 516
Applied Multivariate Analysis
Homework 4
Due October 2, 2018

The file, Set_4.csv, contains data from a study in which college students completed the 10-item Rosenberg Self-Esteem Scale on two occasions spaced 4 weeks apart. The Rosenberg Scale contains the following items, rated using a scale that ranged from 1 (*Strongly Agree*) to 4 (*Strongly Disagree*):

1. I feel that I am a person of worth, at least on an equal basis with others.
2. I feel that I have a number of good qualities.
3. All in all, I am inclined to feel that I am a failure.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I take a positive attitude about myself.
7. On the whole, I am satisfied with myself.
8. I wish I could have more respect for myself.
9. I certainly feel useless at times.
10. At times I think I am no good at all.

The items in the data file have been reversed where necessary so that higher numbers reflect higher self-esteem. The scale is assumed to have a single underlying dimension.

1. For each set of 10 items, use the scree test, parallel analysis, Very Simple Structure (VSS), and Minimum Average Partial (MAP) to determine the appropriate number of principal components to extract. Note that these different ways of determining the appropriate number of components need not agree. In your opinion, is the unidimensionality assumption supported by these tests?

2. Now conduct a principal components analysis on each set of 10 items, extract three principal components from each set, and save the unrotated principal component scores. Calculate the correlations among the combined set of principal component scores (this will be a 6 x 6 matrix).

   (a) What are the correlations for corresponding component scores (Time 1 and Time 2)?

(b) The magnitudes of these correlations will be related to the magnitudes of the component eigenvalues. Why does this make sense?

3. Repeat the analyses, but now rotate to simple structure in the two sets using varimax rotation. Save the rotated principal component scores and examine the intercorrelations.

   (a) Do the principal components from Time 1 replicate at Time 2?
   (b) Why?

4. Repeat the analysis from Question 3, but now use factor analysis (set the factor method option to maximum likelihood, fm="ml"; you might also need to increase the number of iterations).

   (a) How does this affect the eigenvalues for the extracted linear combinations?
   (b) What happens to the pattern of correlations among factor scores?

5. What does this series of analyses tell you about the stability of principal components and factor scores, the hazards of overfactoring, and the importance of replication before trusting the meaning and interpretation of scores?