**Problem Set 2**

**EP 960**

**Exploratory and Confirmatory Factor Analysis**

“Motivation and engagement can be regarded as the driving forces behind learning. Given the importance of mathematics for students’ future lives, school systems need to ensure that students have not only the knowledge that is necessary to continue learning mathematics beyond formal schooling, but also the interest and motivation that will make them want to do so. PISA distinguishes two forms of motivation to learn mathematics: students may learn mathematics because they enjoy it and find it interesting and/or because they perceive learning mathematics as useful. These two constructs are central in self-determination theory (Ryan and Deci, 2009) and expectancy-value theory (Wigfield, Tonks and Klauda, 2009).”

OECD (2013), “Students’ Derive and Motivation”, in PISA 2013 Results: Ready to Learn (Volume III): Students’ Engagement, Drive and Self Beliefs, OECD Publishing.

Data come from the US sample of PISA 2012.

Q29 Thinking about your views on mathematics: to what extent do you agree with the following statements? (Please tick only one box in each row.)

Strongly agree (1)/ Agree (2)/ Disagree (3)/ Strongly disagree (4)

a) I enjoy reading about mathematics. (enjoyread)

b) Making an effort in mathematics is worth it because it will help me in the work that I want to do later on. (effort)

c) I look forward to my mathematics lessons. (lookforward)

d) I do mathematics because I enjoy it. (enjoy)

e) Learning mathematics is worthwhile for me because it will improve my career. (career)

f) I am interested in the things I learn in mathematics. (interest)

g) Mathematics is an important subject for me because I need it for what I want to study later on. (important)

h) I will learn many things in mathematics that will help me get a job. (job)

For this assignment, please conduct the following set of analyses and annotate the output accordingly:

1. Read in the data and code the 999 as NA and omit the missing data.

2. Conduct an exploratory factor analysis using principal axis factoring and promax rotation looking 1,2,3, and 4 factors. At the end of the analyses, report on the number of factors you wish to retain.

3. Conduct the same factor analysis using ML and report fit statistics and the BIC. Report on which model you will select. Provide a name for the factors.

4. Based on your decision regarding the number of factors, conduct a CFA and report the results (fit, factor loadings, etc.)

5. Inspect the modification indices from the CFA for cross-loadings, if any. Provide and explanation based on the wording of the item as to why there may be a cross-loading.

6. Re-estimate the model with the cross-loading added and explain any changes in the factor loadings, fit, etc. Only add one cross-loading.