**PSQF 6249 HW5: Item Response Theory/ Factor Analysis (IRT/IFA) on Your Own Data 16 points; due Monday 11/30/2020 by 11:59 PM via ICON  
  
Please submit this HW5 in an editable format (e.g., .docx or .rtf extension) using   
this file-naming convention: PSQF6249\_Firstname\_Lastname\_HW5**

The goal of HW5 is for you to practice estimating factor analysis-type models on categorical item responses (binary, ordinal, or nominal) that you care about; ideally these are the same data you analyzed for HW3. If you have **six or more indicators of a single dimension**, please use only those indicators that correspond to a single dimension. If you have **fewer than six indicators** for a single dimension, please use enough indicators for **two dimensions** so that your model will be identified. Once you know how this process works, you will be able to repeat it as needed for your other dimensions of interest, so the idea is to start with a model of limited size for now. Given the difference in model relative to HW3, please start from your originally hypothesized model and items again (i.e., to see if you the decisions you made would be the same under a different, nonlinear model).

Conduct a series of analyses to test the following hypotheses. Use a z-scored factor model identification (factor mean = 0, factor variance = 1; otherwise known as anchoring by persons). Note that although there is a list of points to be included below, I STILL DO NOT WANT A NUMBERED LIST FROM YOU. Your text should read like a **traditional results section** in a published paper, and **your tables and figures should be in APA format**. Each numbered point below should be answered in a new paragraph. In answering each question, make sure to describe the empirical criteria by which the answer was provided (i.e., what information, output, or model comparisons support your statements). Introduce and describe all tables and figures.

Note that I am not necessarily expecting you to arrive at a well-fitting model—that may not be possible for your data. I do not expect you to eliminate items based on R2 as in HW2—that was just an exercise designed to give you practice interacting with the syntax. Likewise, it may not make sense for you to move from one to two factors as I did in Example 4. What I want to see is that **you can understand the information provided by your analysis well enough to make \*defendable\* revisions to your model as needed**. If you are not sure what to do about a poorly-fitting model, please ask me for help! Please note that under ML estimation, residual covariances are not possible to add directly. Instead, you will need to do so using specific factors (see Lecture 5 slides 88–89).

You do NOT need to submit any data, syntax, or output with this assignment. However, it’s fine with me if you’d like to include output in order for me to answer any questions you might have.

1. Begin by summarizing the construct(s) being measured and the indicators themselves, including how many there are and their response options. Also provide your sample size and briefly describe the sample. Provide all relevant modeling info: program, estimator(s), how each model was identified, and how models will be compared using a given estimator. The idea is that a reader should be able to replicate your analyses given the information provided. You can start with the same text you wrote for HW3, but make sure to revise it so that it correctly describes the current models (their parameters and interpretation). You can borrow the wording used in my examples (5, 6a, 6b, or 6c) as needed. **(2 points)**
2. First estimate a measurement model that corresponds to your hypothesized dimensionality using WLSMV and PARAMETERIZATION=THETA (also ask for RESDIUAL and STDYX on the OUTPUT command). Report the relevant fit statistics and describe by which indices good fit has been achieved globally. Provide the range of effect sizes across indicators (i.e., standardized loadings). Examine and describe local misfit using the residuals (i.e., discrepancies between model and data) for the predicted correlations. If your model fit is not adequate, consider its sources of local misfit and re-specify the model to try to improve fit. Note that any model modifications should also be theoretically defensible, so provide a rationale for these modifications. Describe the model modification process you followed, and conduct any relevant model comparisons to support your modifications. As before, your goal whose fit is as good as it is going to get but still be theoretically defensible. Conclude by testing the assumption of tau-equivalence (equal discrimination) using DIFFTEST in WLSMV. If the constrained model does not fit worse, proceed using that version. **(5 points)**
3. Re-estimate your final model in ML using LINK=LOGIT and add the plot options (note: these are only available when using Mplus on a Windows OS). Note that if you estimated residual covariances when using WLMSV, you will need to turn them into specific factors instead when using ML (see Lecture 5 slides 88–89. If you encounter estimation problems when using ML, please see me for help troubleshooting. Once the model has estimated without error messages, use the output and the plots to do the following:
   1. Make a table of your final model parameters, including the unstandardized IFA parameters and their SEs. Use the “text to columns” feature in the Data menu of Excel to make this easier, but make sure each parameter is clearly labeled (i.e., do not leave the impoverished labels used per indicator threshold by Mplus). Also provide the corresponding IRT discrimination and difficulty parameters for each item (note: these are only estimated in Mplus by default for binary items, so you will need to use MODEL CONSTRAINT to estimate these for polytomous items). **(4 points)**
   2. Provide and reference a density plot (second option in histogram menu) of your sample’s FSCORE distribution. Note that Mplus will do this for you as a PLOT option; otherwise, import the saved FSCORE file into another package to do so. Also make a plot of test information using the same x-axis as your histogram. How informative are these items for your sample given your goals of measurement?   
      **(2 points)**
   3. Provide and reference a plot describing the spread of difficulty values across responses for each item (see the example 6a spreadsheet for help). How well do the responses appear differentiated across categories? Are there any response options that do not appear useful? Given what you’ve found, would you suggest a different response format for future work with these items? **(3 points)**