5.3 EFA growth modeling

Outline

- EFA background
- EFA variations
  - ESEM, PSEM
  - Second-order, SEFA
  - Bi-factor, DSEFA
  - Target
- EFA in an SEM setting
  - MIMIC
  - EFA/CFA on EFA/CFA
- EFA in a multiple-group setting
  - EFA alignment
- EFA in a longitudinal setting
  - EFA longitudinal invariance testing
  - EFA longitudinal alignment
  - **EFA growth modeling**
- Further topics
- EFA theory

Slide 121 returns to the Outline of the presentation and shows that we have now reached the final longitudinal EFA topic of growth modeling.

Input for EFA Growth Modeling: PSEM GEOMIN Priors

```
                USEVARIABLES = relax1-excit7;

ANALYSIS:       ESTIMATOR = MLR;
                STARTS = 20;
                ITERATIONS = 2000;

MODEL:          f11-f12 BY relax1*1 satis1 conf1
                happy1 energ1 excit1 (a1-a12);
                f21-f22 BY relax2*1 satis2 conf2
                happy2 energ2 excit2 (a1-a12);
                f31-f32 BY relax3*1 satis3 conf3
                happy3 energ3 excit3 (a1-a12);
                f41-f42 BY relax4*1 satis4 conf4
                happy4 energ4 excit4 (a1-a12);
                f51-f52 BY relax5*1 satis5 conf5
                happy5 energ5 excit5 (a1-a12);
                f61-f62 BY relax6*1 satis6 conf6
                happy6 energ6 excit6 (a1-a12);
                f71-f72 BY relax7*1 satis7 conf7
                happy7 energ7 excit7 (a1-a12);

                f11-f12@1;

                f11 WITH f12;
                f21 WITH f22;
                f31 WITH f32;
                f41 WITH f42;
                f51 WITH f52;
                f61 WITH f62;
                f71 WITH f72;
                i1 s1 q1 c1 | f11@0 f21@.1 f31@.2 f41@.3
                f51@.4 f61@.5 f71@.6;
                i2 s2 q2 c2 | f12@0 f22@.1 f32@.2 f42@.3
                f52@.4 f62@.5 f72@.6;

                q1@0; q2@0; c1@0; c2@0;

                ! scalar invariance for intercepts:
                [relax1-relax7] (int1);
                [satis1-satis7] (int2);
                [conf1-conf7] (int3);
                [happy1-happy7] (int4);
                [energ1-energ7] (int5);
                [excit1-excit7] (int6);

                ! time-invariant residual variances:
                relax1 satis1 conf1 happy1 energ1 excit1 (v1-v6);
                relax2 satis2 conf2 happy2 energ2 excit2 (v1-v6);
                relax3 satis3 conf3 happy3 energ3 excit3 (v1-v6);
                relax4 satis4 conf4 happy4 energ4 excit4 (v1-v6);
                relax5 satis5 conf5 happy5 energ5 excit5 (v1-v6);
                relax6 satis6 conf6 happy6 energ6 excit6 (v1-v6);
                relax7 satis7 conf7 happy7 energ7 excit7 (v1-v6);

MODEL PRIORS:   a1-a12 ~ GEOMIN(2,1,0.0001);

OUTPUT:         STANDARDIZED TECH4;

PLOT:           TYPE = PLOT3;
```


Slide 122 shows the input for EFA growth modeling of the PA example.

The left column shows the EFA measurement modeling for the 2 factors at each of the 7 timepoints. It is handled by PSEM. The factor loadings are labeled and given GEOMIN priors in the MODEL PRIORS command. Note that the labels are the same at the 7 different timepoints so that metric invariance is imposed. The GEOMIN settings are shown in the EFA Theory section of the presentation.

In the right column, the growth model is specified for each of the two EFA factors using cubic growth.

Scalar invariance is imposed by intercept equalities across time. This is necessary for the growth modeling.

For parsimony, time invariance of the residual variances is also specified.