```
* IVEware Analysis Examples Replication for ASDA 3rd Edition
* Berglund Winter 2025
* Chapter 13  ;

libname d 'P:\ASDA3\Data Sets for Analysis Examples and Stata R Code' ;
* set SAS options ;
options nocenter nonumber nodate ls=118 ps=68 ;

*set options and location to call IVEware from SAS session ;
options set=srclib "E:\ive 11feb24\sas" sasautos=('!srclib' sasautos) mautosource ;

* 13.2.3 Alternative Approaches to Fitting GLMMs to Survey Data: The PISA Example ;

ods rtf style=normalprinter bodytitle file="P:\ASDA3\Replication Iveware\Chapter 13\Analysis Example Replication ASDA3
IVE C13 Code and Results.rtf" ;

ods text="13.3.3 GLMM with Complex Survey Data is Not Available in IVEware" ;

* 13.3.1 An SEM Example: Analysis of ESS Data from Belgium ;
* This example uses JRR with SASMOD and SAS PROC CALIS to perform SEM for Complex Sample data ;
* run with PROC CALIS and SASMOD ;

data ess_belgium ;
 set d.immig ;
 keep trstplt trstprt imsmetn imdfetn impcntr weight psu ;
run ;

* Run PROC CALIS without SASMOD first ;
title "PROC CALIS No SASMOD" ;
proc calis ;
where trstplt ne 88 and trstprt ne 88 and imsmetn ne 8 and imdfetn ne 8 and impcntr ne 8 ;
weight weight ;
path
 trstplt trstprt <--- Trust = 1,
 imsmetn imdfetn impcntr <--- Immig = 1,
 Trust ---> Immig ;
run ;

title "PROC CALIS with SASMOD for JRR" ;
* Use SASMOD to obtain JRR variance estimates ;
%sasmod (setup=new, name=13.3.1 SEM Example , dir=P:\ASDA3\Replication Iveware\Chapter 13) ;
title  SASMOD with PROC CALIS for SEM Model, Example 13.3.1 ;
datain ess_belgium ;
cluster psu ;
weight weight ;

* SAS code here ;
proc calis ;
where trstplt ne 88 and trstprt ne 88 and imsmetn ne 8 and imdfetn ne 8 and impcntr ne 8 ;
path
 trstplt trstprt <--- Trust = 1,
 imsmetn imdfetn impcntr <--- Immig = 1,
 Trust ---> Immig ;
run ;

* Note that explanation of the PROC CALIS output is included in the information from SAS;

ods text="Non-probability Sample, Machine Learning, Small Area Estimation and Non-Parametric analyses are not available
in IVEware" ;

ods rtf close ;
```

13.3.3 GLMM with Complex Survey Data is Not Available in IVEware

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Model and Initial Values

Modeling Information	
Maximum Likelihood Estimation	
Data Set	WORK.ESS_BELGIUM
N Records Read	1676
N Records Used	1676
N Obs	1676
Model Type	PATH
Analysis	Covariances

Variables in the Model		
Endogenous	**Manifest**	imdfetn impcntr imsmetn trstplt trstprt
	Latent	Immig
Exogenous	**Manifest**	
	Latent	Trust
Number of Endogenous Variables = 6 **Number of Exogenous Variables = 1**		

Initial Estimates for PATH List				
Path			**Parameter**	**Estimate**
trstplt	**<===**	**Trust**		1.00000
trstprt	**<===**	**Trust**	_Parm1	.
imsmetn	**<===**	**Immig**		1.00000
imdfetn	**<===**	**Immig**	_Parm2	.
impcntr	**<===**	**Immig**	_Parm3	.
Trust	**===>**	**Immig**	_Parm4	.

Initial Estimates for Variance Parameters			
Variance Type	**Variable**	**Parameter**	**Estimate**
Exogenous	**Trust**	_Add1	.
Error	**trstplt**	_Add2	.
	trstprt	_Add3	.
	imsmetn	_Add4	.
	imdfetn	_Add5	.
	impcntr	_Add6	.
	Immig	_Add7	.
NOTE: Parameters with prefix '_Add' are added by PROC CALIS.			

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Descriptive Statistics

Simple Statistics			
Variable		Mean	Std Dev
trstplt	trust in politicians	3.86629	3.12406
trstprt	trust in political parties	3.84673	3.10625
imsmetn	allow many/few immigrants of same race/ethnic group as majority	2.20542	1.16231
imdfetn	allow many/few immigrants of different race/ethnic group from majority	2.51404	1.25630
impcntr	allow many/few immigrants from poorer countries outside europe	2.50647	1.21094

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Optimization

Initial Estimation Methods	
1	Instrumental Variables Method
2	McDonald Method
3	Two-Stage Least Squares

Optimization Start Parameter Estimates			
N	**Parameter**	**Estimate**	**Gradient**
1	**_Parm1**	0.99933	-0.0002121
2	**_Parm2**	1.31166	-0.00482
3	**_Parm3**	1.15292	0.02998
4	**_Parm4**	-0.07215	-0.00498
5	**_Add1**	8.26383	3.5022E-6
6	**_Add2**	1.49591	-0.0000472
7	**_Add3**	1.39598	0.0000293
8	**_Add4**	0.56519	0.04947
9	**_Add5**	0.22639	0.02303
10	**_Add6**	0.42190	-0.08301
11	**_Add7**	0.74276	-0.0002225
Value of Objective Function = 0.0040205489			

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Optimization

Levenberg-Marquardt Optimization

Scaling Update of More (1978)

Parameter Estimates	11
Functions (Observations)	15

Optimization Start			
Active Constraints	0	**Objective Function**	0.0040205489
Max Abs Gradient Element	0.0830120992	**Radius**	1

Iteration		Restarts	Function Calls	Active Constraints		Objective Function	Objective Function Change	Max Abs Gradient Element	Lambda	Ratio Between Actual and Predicted Change
1		0	4	0		0.0008872	0.00313	0.00488	0	1.005
2		0	6	0		0.0008847	2.541E-6	0.000025	0	0.997
3		0	8	0		0.0008847	3.78E-10	2.064E-6	0	0.991

Optimization Results			
Iterations	3	**Function Calls**	11
Jacobian Calls	5	**Active Constraints**	0
Objective Function	0.0008846761	**Max Abs Gradient Element**	2.0635449E-6
Lambda	0	**Actual Over Pred Change**	0.9914150577
Radius	0.0001008326		

Convergence criterion (ABSGCONV=0.00001) satisfied.

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Summary		
Modeling Info	Number of Observations	1676
	Number of Variables	5
	Number of Moments	15
	Number of Parameters	11
	Number of Active Constraints	0
	Baseline Model Function Value	3.0130
	Baseline Model Chi-Square	5046.7336
	Baseline Model Chi-Square DF	10
	Pr > Baseline Model Chi-Square	<.0001
Absolute Index	Fit Function	0.0009
	Chi-Square	1.4818
	Chi-Square DF	4
	Pr > Chi-Square	0.8299
	Z-Test of Wilson & Hilferty	-0.9599
	Hoelter Critical N	10725
	Root Mean Square Residual (RMR)	0.0201
	Standardized RMR (SRMR)	0.0054
	Goodness of Fit Index (GFI)	0.9996
Parsimony Index	Adjusted GFI (AGFI)	0.9987
	Parsimonious GFI	0.3999
	RMSEA Estimate	0.0000
	RMSEA Lower 90% Confidence Limit	0.0000
	RMSEA Upper 90% Confidence Limit	0.0217
	Probability of Close Fit	0.9998
	ECVI Estimate	0.0141
	ECVI Lower 90% Confidence Limit	0.0156
	ECVI Upper 90% Confidence Limit	0.0175
	Akaike Information Criterion	23.4818
	Bozdogan CAIC	94.1477
	Schwarz Bayesian Criterion	83.1477
	McDonald Centrality	1.0008
Incremental Index	Bentler Comparative Fit Index	1.0000
	Bentler-Bonett NFI	0.9997
	Bentler-Bonett Non-normed Index	1.0012
	Bollen Normed Index Rho1	0.9993
	Bollen Non-normed Index Delta2	1.0005
	James et al. Parsimonious NFI	0.3999

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

PATH List							
Path			Parameter	Estimate	Standard Error	t Value	Pr > |t|
trstplt	<===	Trust		1.00000			
trstprt	<===	Trust	_Parm1	1.00173	0.06543	15.3090	<.0001
imsmetn	<===	Immig		1.00000			
imdfetn	<===	Immig	_Parm2	1.30899	0.03490	37.5018	<.0001
impcntr	<===	Immig	_Parm3	1.11590	0.03116	35.8120	<.0001
Trust	===>	Immig	_Parm4	-0.07236	0.00859	-8.4214	<.0001

Variance Parameters						
Variance Type	Variable	Parameter	Estimate	Standard Error	t Value	Pr > |t|
Exogenous	Trust	_Add1	8.24409	0.62291	13.2348	<.0001
Error	trstplt	_Add2	1.51565	0.52893	2.8655	0.0042
	trstprt	_Add3	1.37621	0.53029	2.5952	0.0095
	imsmetn	_Add4	0.54626	0.02319	23.5592	<.0001
	imdfetn	_Add5	0.19944	0.02388	8.3499	<.0001
	impcntr	_Add6	0.46432	0.02315	20.0589	<.0001
	Immig	_Add7	0.76155	0.04251	17.9156	<.0001

Squared Multiple Correlations			
Variable	Error Variance	Total Variance	R-Square
imdfetn	0.19944	1.57828	0.8736
impcntr	0.46432	1.46637	0.6834
imsmetn	0.54626	1.35097	0.5957
trstplt	1.51565	9.75974	0.8447
trstprt	1.37621	9.64877	0.8574
Immig	0.76155	0.80472	0.0536

PROC CALIS No SASMOD

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Standardized Results for PATH List

Path			Parameter	Estimate	Standard Error	t Value	Pr > |t|
trstplt	**<===**	**Trust**		0.91908	0.02958	31.0678	<.0001
trstprt	**<===**	**Trust**	_Parm1	0.92594	0.02976	31.1110	<.0001
imsmetn	**<===**	**Immig**		0.77179	0.01180	65.3909	<.0001
imdfetn	**<===**	**Immig**	_Parm2	0.93469	0.00834	112.0	<.0001
impcntr	**<===**	**Immig**	_Parm3	0.82665	0.01035	79.8321	<.0001
Trust	**===>**	**Immig**	_Parm4	-0.23162	0.02537	-9.1292	<.0001

Standardized Results for Variance Parameters

Variance Type	Variable	Parameter	Estimate	Standard Error	t Value	Pr > |t|
Exogenous	**Trust**	_Add1	1.00000			
Error	**trstplt**	_Add2	0.15530	0.05438	2.8559	0.0043
	trstprt	_Add3	0.14263	0.05512	2.5878	0.0097
	imsmetn	_Add4	0.40434	0.01822	22.1942	<.0001
	imdfetn	_Add5	0.12636	0.01560	8.1017	<.0001
	impcntr	_Add6	0.31664	0.01712	18.4957	<.0001
	Immig	_Add7	0.94635	0.01175	80.5205	<.0001

PROC CALIS with SASMOD for JRR

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

PROC CALIS with SASMOD for JRR

```
IVEware Setup Checker, 02MAR25,  9:59:56

Setup listing:
title  SASMOD with PROC CALIS for SEM Model, Example 13.3.1 ;
datain ess_belgium ;
cluster psu ;
weight weight ;
* SAS code here ;
proc calis ;
where trstplt ne 88 and trstprt ne 88 and imsmetn ne 8 and imdfetn ne 8 and impcntr ne 8 ;
path
trstplt trstprt <--- Trust = 1,
imsmetn imdfetn impcntr <--- Immig = 1,
Trust ---> Immig ;
run ;
```

PROC CALIS with SASMOD for JRR

```
IVEware Multiple Imputation Regression, Sun Mar 02 10:00:27 2025                 1

SASMOD with PROC CALIS for SEM Model, Example 13.3.1


Valid cases              1703
Sum weights       3533.485425
Replicates                124

Degr freedom              124

Variable             Estimate          Std Error          Wald test         Prob > Chi
_Parm1              1.0017251          0.0623855          257.82808            0.00000
_Parm2              1.3089893          0.0526756          617.52284            0.00000
_Parm3              1.1158968          0.0469618          564.62386            0.00000
_Parm4             -0.0723645          0.0114157           40.18303            0.00000
_Add1               8.2440902          0.7405646          123.92517            0.00000
_Add2               1.5156540          0.5102336            8.82393            0.00297
_Add3               1.3762112          0.5808345            5.61391            0.01782
_Add4               0.5462552          0.0351086          242.08241            0.00000
_Add5               0.1994367          0.0417683           22.79908            0.00000
_Add6               0.4643167          0.0460768          101.54636            0.00000
_Add7               0.7615453          0.0743238          104.98703            0.00000

Variable             Estimate              95% Confidence Interval
                                               Lower              Upper
_Parm1              1.0017251          0.8782472          1.1252029
_Parm2              1.3089893          1.2047299          1.4132486
_Parm3              1.1158968          1.0229467          1.2088469
_Parm4             -0.0723645         -0.0949594         -0.0497697
_Add1               8.2440902          6.7783113          9.7098691
_Add2               1.5156540          0.5057628          2.5255451
_Add3               1.3762112          0.2265816          2.5258407
_Add4               0.5462552          0.4767657          0.6157448
_Add5               0.1994367          0.1167659          0.2821074
_Add6               0.4643167          0.3731183          0.5555152
_Add7               0.7615453          0.6144383          0.9086523
```

Non-probability Sample, Machine Learning, Small Area Estimation and Non-Parametric analyses are not available in IVEware