

# Supplementary Materials for Yuan, Zhang, and Deng

September 12, 2015

## 1 Using WebSEM for Data Analysis

The fit indices for mean structures with growth curve models developed in this article are currently available in WebSEM, which is free online software that allows researchers to conduct SEM analysis through path diagrams (Zhang & Yuan, 2012-2015).<sup>1</sup>In this section, we illustrate how to obtain the fit indices in WebSEM through the linear model with equal error variances in Example 4 used in the paper. A video with instructions on how to conduct the data analysis is also available on YouTube (<https://youtu.be/1ydG3IxBI5M>).

To use WebSEM, one needs to provide a data file and draw a path diagram. The data file should be a free format text file with the extension name txt. The data file can be generated using any text editor or the default editor within WebSEM. Both raw data and summary data can be used. If raw data are used, the first line of the data file should be variable names and the rest are data entries. If summary data are used, the first row includes the variable names. The second row provides the value of the sample size that is repeated for each column of data. The third row includes information on the sample means. The rest is the full sample covariance matrix. For example, the summary data in the data file for Example 4 are given below. Clearly, there are six variables named close1, close2, close3, close4, close5 and gender, respectively, and the sample size is 851. Note that the value 851 repeats itself 6 times.

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close1	close2	close3	close4	close5	gender
851	851	851	851	851	851
37.9542	37.2785	37.0463	36.5696	36.1363	0.4900
6.3944	3.2716	4.1435	3.7058	4.1286	-0.0940
3.2716	7.5282	6.0804	5.1597	5.7608	-0.0390
4.1435	6.0804	10.7290	6.5672	7.2365	-0.1521
3.7058	5.1597	6.5672	10.2920	7.6463	-0.1104
4.1286	5.7608	7.2365	7.6463	12.9085	-0.1469
-0.0940	-0.0390	-0.1521	-0.1104	-0.1469	0.2502

---

WebSEM provides an intuitive and interactive interface to draw path diagram for a model for data analysis. Information on how to use the interface can be found in Zhang and Yuan (2012-2015). The path diagram for the linear growth curve model drawn by WebSEM is given in Figure 2a. The video on YouTube showed how to draw a path diagram interactively. Because the use of summary data instead of raw data, we put “`data=cov`” in the control field of WebSEM. Furthermore, to request the fit indices for the mean structure, type “`mean.fit`” in the control field; otherwise, only fit indices for the combined mean and covariance structure will be produced.

The output of WebSEM by running the analysis is shown below.<sup>2</sup> Test Statistics and Fit Indices for both mean and covariance, covariance only, and mean only are given at the beginning of the output. For example, for evaluating both mean and covariance together, the chi-square statistic is 81.653 with 17 degrees of freedom. The corresponding p-value is essentially 0. The CFI is 0.971, NFI is 0.964, NNFI is 0.961 and RMSEA is 0.067. For mean only, the chi-square statistics is 5.073 (p-value = 0.167) and RMSEA is 0.028.

<sup>1</sup>Zhang, Z. & Yuan, K.-H. (2012-2015). WebSEM: Structural equation modeling online [Manual available at <http://psychstat.org/websem>]. Retrievable from <https://websem.psychstat.org>.

<sup>2</sup>The known parameters are removed from the output to save space.

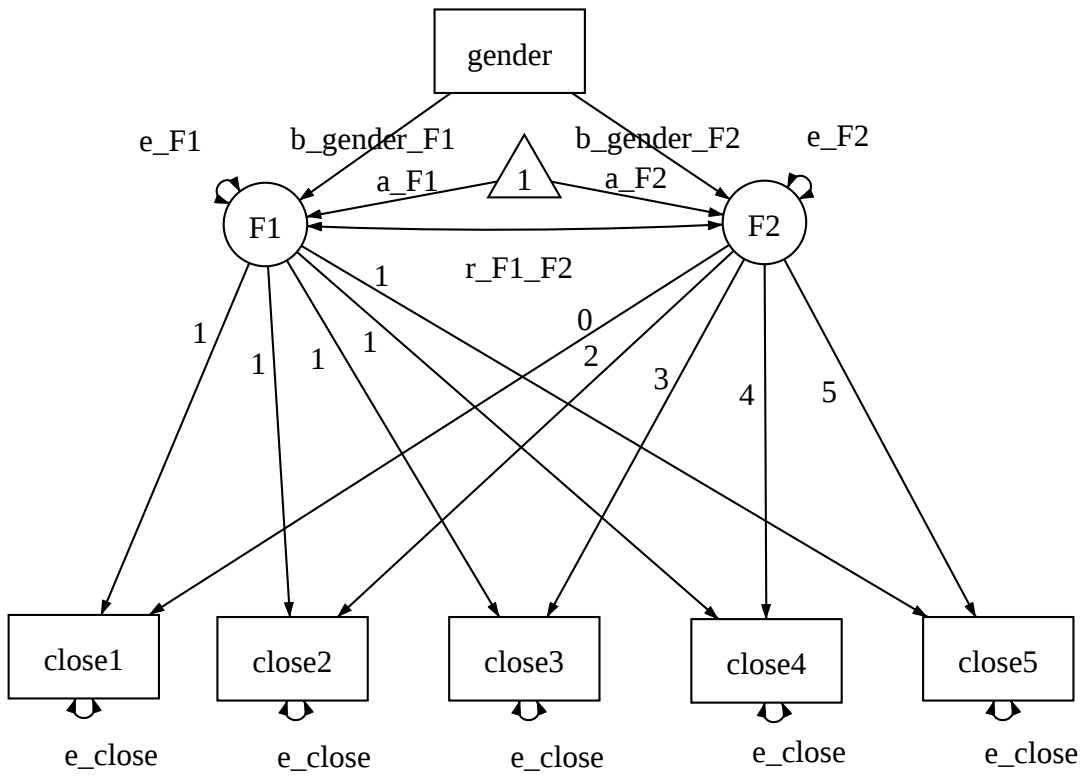


Figure 1: Path diagram for the linear growth curve model with equal error variances. The path diagram was drawn by WebSEM.

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Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	81.653	
Degrees of freedom	17	
p-value	0	
Chi-square statistic (baseline model)	2272.4	
Degrees of freedom (baseline model)	23	
CFI	0.971	
NFI	0.964	
NNFI	0.961	
RMSEA	0.067	

Fit for covariance only

Chi-square statistic	76.586	
Degrees of freedom	14	
p-value	0	
Chi-square statistic (baseline model)	2107.8	
Degrees of freedom (baseline model)	19	
CFI	0.97	
NFI	0.964	
NNFI	0.959	
RMSEA	0.072	

Fit for mean only

Chi-square statistic	5.073	
Degrees of freedom	3	
p-value	0.167	
Chi-square statistic (baseline model)	287.88	
Degrees of freedom (baseline model)	4	
CFI	0.993	
NFI	0.982	
NNFI	0.99	
RMSEA	0.028	

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Regressions:				
F1 ~				
gendr (b__F1)	-0.289	0.163	-1.770	0.077
F2 ~				
gendr (b__F2)	-0.052	0.043	-1.216	0.224
Covariances:				
F1 ~~				
F2 (r_F1)	0.249	0.056	4.420	0.000
Intercepts:				
F1 (a_F1)	38.141	0.114	334.196	0.000
F2 (a_F2)	-0.333	0.030	-11.169	0.000
Variances:				
F1 (e_F1)	2.956	0.284	10.399	0.000
F2 (e_F2)	0.136	0.020	6.804	0.000
close1 (e_c1)	3.696	0.103	35.728	0.000
close2 (e_c1)	3.696	0.103	35.728	0.000

close3 (e_c1)	3.696	0.103	35.728	0.000
close4 (e_c1)	3.696	0.103	35.728	0.000
close5 (e_c1)	3.696	0.103	35.728	0.000

Path diagrams and complete output for all models used in the paper are available as supplementary materials at <http://>.

## 1.1 Example 1

The summary data used in this example are given below. The model in Figure 2a is used.

y1	y2	y3	y4	y5	y6
200	200	200	200	200	200
1.0	1.5	2.0	2.5	3.0	3.5
2.0	2.0	2.0	2.5	3.0	3.5
2.0	4.0	4.5	6.0	7.5	9.0
2.0	4.5	8.0	10.0	12.0	14.5
2.5	6.0	10.0	14.0	16.5	20.0
3.0	7.5	12.0	16.5	22.0	26.0
3.5	9.0	14.5	20.0	26.0	32.0

The output of WebSEM by running the analysis is shown below.

### Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	103.66
Degrees of freedom	21
p-value	0
Chi-square statistic (baseline model)	2451.2
Degrees of freedom (baseline model)	25
CFI	0.966
NFI	0.958
NNFI	0.959
RMSEA	0.14

Fit for covariance only

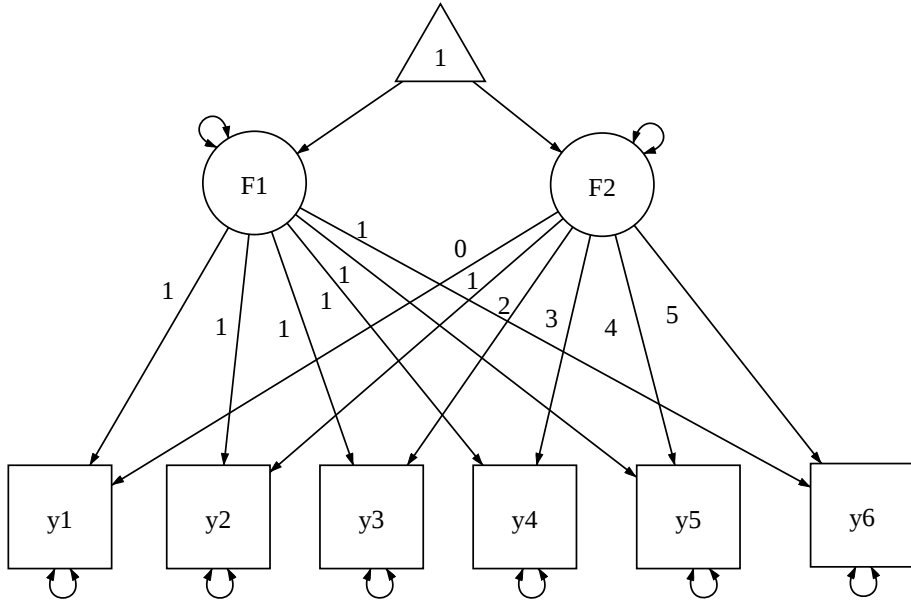
Chi-square statistic	103.66
Degrees of freedom	17
p-value	0
Chi-square statistic (baseline model)	2389.8
Degrees of freedom (baseline model)	20
CFI	0.963
NFI	0.957
NNFI	0.957
RMSEA	0.16

Fit for mean only

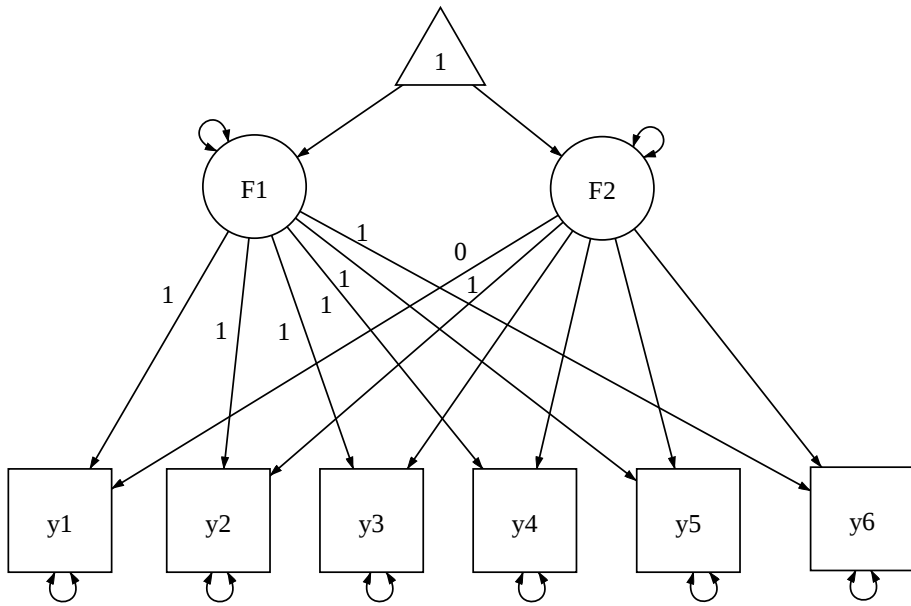
Chi-square statistic	0
Degrees of freedom	4
p-value	1
Chi-square statistic (baseline model)	46.494
Degrees of freedom (baseline model)	5
CFI	1
NFI	1
NNFI	1.12
RMSEA	0

Parameter Estimates

Estimate	Std.err	Z-value	P(> z )
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(a) A linear growth curve model



(b) A nonlinear growth curve model

Figure 2: Path diagrams for models used in Examples 1-4

Latent variables:

```
F1 =~
  y1      1.000
  y2      1.000
  y3      1.000
  y4      1.000
  y5      1.000
  y6      1.000
F2 =~
  y1      0.000
  y2      1.000
  y3      2.000
  y4      3.000
  y5      4.000
  y6      5.000
```

Covariances:

```
F1 ~~
  F2      (r_F1)    0.406    0.099    4.090    0.000
```

Intercepts:

```
F1      1.000    0.093    10.702    0.000
F2      0.500    0.073     6.819    0.000
y1      0.000
y2      0.000
y3      0.000
y4      0.000
y5      0.000
y6      0.000
```

Variances:

```
y1      (e_y)    0.768    0.038    20.000    0.000
y2      (e_y)    0.768    0.038    20.000    0.000
y3      (e_y)    0.768    0.038    20.000    0.000
y4      (e_y)    0.768    0.038    20.000    0.000
y5      (e_y)    0.768    0.038    20.000    0.000
y6      (e_y)    0.768    0.038    20.000    0.000
F1      (e_F1)    1.344    0.176     7.647    0.000
F2      (e_F2)    1.032    0.108     9.590    0.000
```

---

## 1.2 Example 2

The summary data used in this example are given below. The same model in Figure 2a is used.

---

y1	y2	y3	y4	y5	y6
200.0	200.0	200.0	200.0	200.0	200.0
1.0	1.5	2.0	2.5	3.0	3.5
2.0	2.2	2.0	2.5	3.0	3.5
2.2	4.0	4.5	6.0	7.5	9.0
2.0	4.5	8.0	10.2	12.0	14.5
2.5	6.0	10.2	14.0	16.5	20.0
3.0	7.5	12.0	16.5	22.0	26.2
3.5	9.0	14.5	20.0	26.2	32.0

---

The output of the analysis is given below.

---

Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	188.53	
Degrees of freedom	16	
p-value	0	
Chi-square statistic (baseline model)	2255.5	
Degrees of freedom (baseline model)	20	
CFI	0.923	
NFI	0.916	
NNFI	0.904	
RMSEA	0.232	

Fit for covariance only

Chi-square statistic	188.53	
Degrees of freedom	12	
p-value	0	
Chi-square statistic (baseline model)	2172.6	
Degrees of freedom (baseline model)	15	
CFI	0.918	
NFI	0.913	
NNFI	0.898	
RMSEA	0.271	

Fit for mean only

Chi-square statistic	0	
Degrees of freedom	4	
p-value	1	
Chi-square statistic (baseline model)	46.193	
Degrees of freedom (baseline model)	5	
CFI	1	
NFI	1	
NNFI	1.121	
RMSEA	0	

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
y1	1.000			
y2	1.000			
y3	1.000			
y4	1.000			
y5	1.000			
F2 =~				
y1	0.000			
y2	1.000			
y3	2.000			
y4	3.000			
y5	4.000			
F1 =~				
y6	1.000			
F2 =~				
y6	5.000			

Covariances:

F1	~~				
F2	(r_F1)	0.326	0.103	3.160	0.002
Intercepts:					
F2		0.500	0.074	6.797	0.000
F1		1.000	0.097	10.321	0.000
y1		0.000			
y2		0.000			
y3		0.000			
y4		0.000			
y5		0.000			
y6		0.000			
Variances:					
y1		0.288	0.073	3.957	0.000
y2		0.438	0.058	7.525	0.000
y3		1.188	0.130	9.115	0.000
y4		1.226	0.134	9.180	0.000
y5		0.405	0.064	6.311	0.000
F1		1.687	0.192	8.793	0.000
F2		1.065	0.108	9.838	0.000
y6		0.255	0.093	2.751	0.006

---

### 1.3 Example 3

The summary data for Example 3 are given below.

---

y1	y2	y3	y4	y5	y6
200.0	200.0	200.0	200.0	200.0	200.0
1.2	1.5	2.0	2.5	3.0	3.2
2.0	1.5	2.0	2.5	3.0	3.5
1.5	4.0	4.5	6.0	7.5	9.0
2.0	4.5	8.0	9.5	12.0	14.5
2.5	6.0	9.5	14.0	16.5	20.0
3.0	7.5	12.0	16.5	22.0	25.5
3.5	9.0	14.5	20.0	25.5	32.0

---

The linear growth curve model in Figure 2a is first fitted to the data and the output is given below.

---

Test Statistics and Fit Indices	
Fit for both mean and covariance	
Chi-square statistic	7.733
Degrees of freedom	16
p-value	0.956
Chi-square statistic (baseline model)	1716.8
Degrees of freedom (baseline model)	20
CFI	1
NFI	0.995
NNFI	1.006
RMSEA	0
Fit for covariance only	
Chi-square statistic	0.075
Degrees of freedom	12
p-value	1
Chi-square statistic (baseline model)	1654.9



Degrees of freedom (baseline model)	15			
CFI	1			
NFI	1			
NNFI	1.009			
RMSEA	0			
Fit for mean only				
Chi-square statistic	7.697			
Degrees of freedom	4			
p-value	0.103			
Chi-square statistic (baseline model)	42.64			
Degrees of freedom (baseline model)	5			
CFI	0.902			
NFI	0.819			
NNFI	0.877			
RMSEA	0.068			
Parameter Estimates				
	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
y1	1.000			
y2	1.000			
y3	1.000			
y4	1.000			
y5	1.000			
F2 =~				
y1	0.000			
y2	1.000			
y3	2.000			
y4	3.000			
y5	4.000			
F1 =~				
y6	1.000			
F2 =~				
y6	5.000			
Covariances:				
F1 ~~				
F2	0.499	0.094	5.327	0.000
Intercepts:				
F2	0.429	0.073	5.902	0.000
F1	1.162	0.087	13.304	0.000
y1	0.000			
y2	0.000			
y3	0.000			
y4	0.000			
y5	0.000			
y6	0.000			
Variances:				
y1	0.999	0.146	6.819	0.000
y2	1.007	0.122	8.223	0.000
y3	0.994	0.116	8.599	0.000
y4	0.995	0.122	8.127	0.000

y5	1.018	0.151	6.761	0.000
F1	0.991	0.158	6.266	0.000
F2	0.994	0.105	9.440	0.000
y6	1.024	0.204	5.015	0.000

The nonlinear growth curve model in Figure 2b is then fitted to the data and the output is given below.

Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	6.429		
Degrees of freedom	12		
p-value	0.893		
Chi-square statistic (baseline model)	1716.8		
Degrees of freedom (baseline model)	20		
CFI	1		
NFI	0.996		
NNFI	1.005		
RMSEA	0		

Fit for covariance only

Chi-square statistic	1.14		
Degrees of freedom	8		
p-value	0.997		
Chi-square statistic (baseline model)	1654.9		
Degrees of freedom (baseline model)	15		
CFI	1		
NFI	0.999		
NNFI	1.008		
RMSEA	0		

Fit for mean only

Chi-square statistic	5.315		
Degrees of freedom	4		
p-value	0.256		
Chi-square statistic (baseline model)	40.555		
Degrees of freedom (baseline model)	5		
CFI	0.963		
NFI	0.869		
NNFI	0.954		
RMSEA	0.041		

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
y1	1.000			
y2	1.000			
y3	1.000			
y4	1.000			
y5	1.000			
F2 =~				
y1	0.000			
y2	1.000			
y3	2.079	0.178	11.705	0.000
y4	3.159	0.276	11.435	0.000
y5	4.239	0.380	11.168	0.000
F1 =~				
y6	1.000			

F2 =~					
y6	5.193	0.472	10.993	0.000	
Covariances:					
F1 ~~					
F2	0.490	0.092	5.313	0.000	
Intercepts:					
F2	0.410	0.080	5.143	0.000	
F1	1.165	0.090	12.987	0.000	
y1	0.000				
y2	0.000				
y3	0.000				
y4	0.000				
y5	0.000				
y6	0.000				
Variances:					
y1	1.003	0.147	6.827	0.000	
y2	1.002	0.122	8.180	0.000	
y3	0.994	0.116	8.600	0.000	
y4	0.990	0.122	8.085	0.000	
y5	0.989	0.152	6.490	0.000	
F1	1.005	0.165	6.081	0.000	
F2	0.899	0.200	4.493	0.000	
y6	1.064	0.208	5.115	0.000	

---

## 1.4 Example 4

The summary data for Example 4 are given below.

---

y1	y2	y3	y4	y5	y6
200.0	200.0	200.0	200.0	200.0	200.0
1.2	1.5	2.0	2.5	3.0	3.1
2.0	1.5	2.0	2.5	3.0	3.5
1.5	4.0	4.5	6.0	7.5	9.0
2.0	4.5	8.0	9.5	12.0	14.5
2.5	6.0	9.5	14.0	16.5	20.0
3.0	7.5	12.0	16.5	22.0	25.5
3.5	9.0	14.5	20.0	25.5	32.0

---

The linear growth curve model in Figure 2a is first fitted to the data and the output is given below.

---

```

Test Statistics and Fit Indices
Fit for both mean and covariance
  Chi-square statistic   12.701
  Degrees of freedom     16
  p-value                0.695
  Chi-square statistic (baseline model)  1715
  Degrees of freedom (baseline model)    20
  CFI                    1
  NFI                    0.993
  NNFI                   1.002
  RMSEA                  0
Fit for covariance only

```

Chi-square statistic 0.244  
 Degrees of freedom 12  
 p-value 1  
 Chi-square statistic (baseline model) 1654.8  
 Degrees of freedom (baseline model) 15  
 CFI 1  
 NFI 1  
 NNFI 1.009  
 RMSEA 0

Fit for mean only

Chi-square statistic 12.519  
 Degrees of freedom 4  
 p-value 0.014  
 Chi-square statistic (baseline model) 45.286  
 Degrees of freedom (baseline model) 5  
 CFI 0.789  
 NFI 0.724  
 NNFI 0.736  
 RMSEA 0.103

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
y1	1.000			
y2	1.000			
y3	1.000			
y4	1.000			
y5	1.000			
F2 =~				
y1	0.000			
y2	1.000			
y3	2.000			
y4	3.000			
y5	4.000			
F1 =~				
y6	1.000			
F2 =~				
y6	5.000			

Covariances:

F1 ~~				
F2	0.500	0.094	5.336	0.000

Intercepts:

F2	0.415	0.073	5.708	0.000
F1	1.180	0.087	13.497	0.000
y1	0.000			
y2	0.000			
y3	0.000			
y4	0.000			
y5	0.000			
y6	0.000			

Variances:

y1	0.997	0.146	6.807	0.000
y2	1.009	0.123	8.227	0.000
y3	0.992	0.116	8.588	0.000
y4	0.995	0.123	8.098	0.000
y5	1.029	0.153	6.743	0.000
F1	0.990	0.158	6.254	0.000
F2	0.993	0.105	9.432	0.000
y6	1.062	0.209	5.081	0.000

The nonlinear growth curve model in Figure 2b is then fitted to the data and the output is given below.

Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	10.609		
Degrees of freedom	12		
p-value	0.563		
Chi-square statistic (baseline model)		1715	
Degrees of freedom (baseline model)		20	
CFI	1		
NFI	0.994		
NNFI	1.001		
RMSEA	0		

Fit for covariance only

Chi-square statistic	1.928		
Degrees of freedom	8		
p-value	0.983		
Chi-square statistic (baseline model)		1654.8	
Degrees of freedom (baseline model)		15	
CFI	1		
NFI	0.999		
NNFI	1.007		
RMSEA	0		

Fit for mean only

Chi-square statistic	8.725		
Degrees of freedom	4		
p-value	0.068		
Chi-square statistic (baseline model)		41.978	
Degrees of freedom (baseline model)		5	
CFI	0.872		
NFI	0.792		
NNFI	0.84		
RMSEA	0.077		

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
y1	1.000			
y2	1.000			
y3	1.000			
y4	1.000			
y5	1.000			
F2 =~				
y1	0.000			
y2	1.000			
y3	2.077	0.177	11.720	0.000

y4	3.155	0.275	11.452	0.000
y5	4.232	0.378	11.185	0.000
F1 =~				
y6	1.000			
F2 =~				
y6	5.144	0.467	11.012	0.000
Covariances:				
F1 ~~				
F2	0.487	0.092	5.270	0.000
Intercepts:				
F2	0.401	0.080	5.030	0.000
F1	1.178	0.090	13.147	0.000
y1	0.000			
y2	0.000			
y3	0.000			
y4	0.000			
y5	0.000			
y6	0.000			
Variances:				
y1	1.000	0.147	6.797	0.000
y2	1.003	0.123	8.185	0.000
y3	0.993	0.116	8.590	0.000
y4	0.989	0.123	8.045	0.000
y5	0.990	0.154	6.424	0.000
F1	0.997	0.165	6.048	0.000
F2	0.910	0.202	4.499	0.000
y6	1.114	0.211	5.268	0.000

---

## 1.5 Example 5.

The data used in this example are given below.

---

```

close1 close3 close4 close5 close6 gender
851 851 851 851 851 851
37.9542 37.2785 37.0463 36.5696 36.1363 0.4900
6.3944 3.2716 4.1435 3.7058 4.1286 -0.0940
3.2716 7.5282 6.0804 5.1597 5.7608 -0.0390
4.1435 6.0804 10.7290 6.5672 7.2365 -0.1521
3.7058 5.1597 6.5672 10.2920 7.6463 -0.1104
4.1286 5.7608 7.2365 7.6463 12.9085 -0.1469
-0.0940 -0.0390 -0.1521 -0.1104 -0.1469 0.2502

```

---

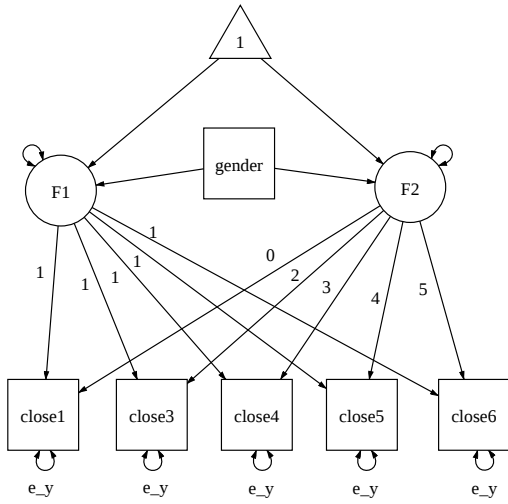
The output for the linear model with a covariate and with equal error variance in Figure 3a is given below.

---

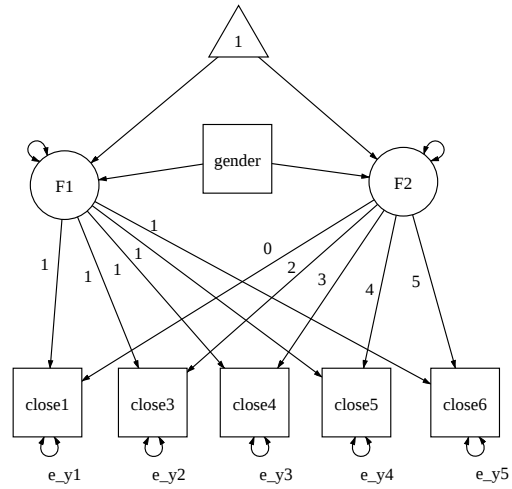
```

Test Statistics and Fit Indices
Fit for both mean and covariance
    Chi-square statistic    81.653
    Degrees of freedom      17
    p-value                  0
    Chi-square statistic (baseline model) 2272.4
    Degrees of freedom (baseline model)   23

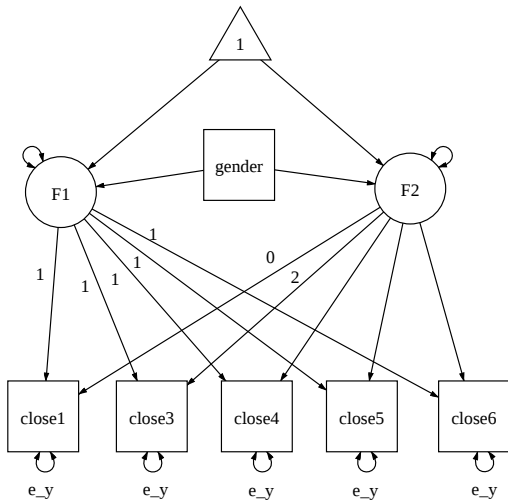
```



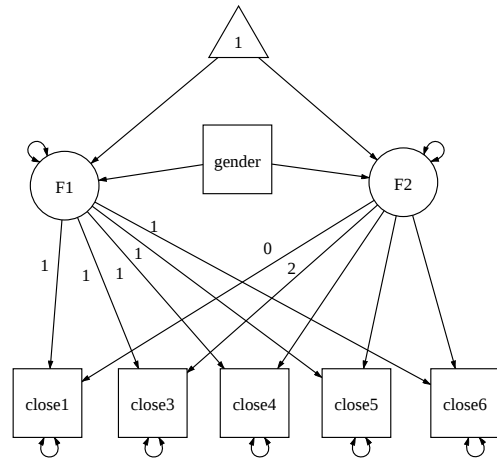
(a) Linear model with equal error variances



(b) Linear model with unequal error variances



(c) Nonlinear model with equal error variances



(d) Nonlinear model with unequal error variances

Figure 3: Path diagrams for growth curve models used in Example 5

CFI	0.971			
NFI	0.964			
NNFI	0.961			
RMSEA	0.067			
Fit for covariance only				
Chi-square statistic	76.586			
Degrees of freedom	14			
p-value	0			
Chi-square statistic (baseline model)	2107.8			
Degrees of freedom (baseline model)	19			
CFI	0.97			
NFI	0.964			
NNFI	0.959			
RMSEA	0.072			
Fit for mean only				
Chi-square statistic	5.073			
Degrees of freedom	3			
p-value	0.167			
Chi-square statistic (baseline model)	287.88			
Degrees of freedom (baseline model)	4			
CFI	0.993			
NFI	0.982			
NNFI	0.99			
RMSEA	0.028			

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
close1	1.000			
close3	1.000			
close4	1.000			
close5	1.000			
close6	1.000			
F2 =~				
close1	0.000			
close3	2.000			
close4	3.000			
close5	4.000			
close6	5.000			
Regressions:				
F1 ~				
gender	-0.289	0.163	-1.770	0.077
F2 ~				
gender	-0.052	0.043	-1.216	0.224
Covariances:				
F1 ~~				
F2	0.249	0.056	4.420	0.000
Intercepts:				
F2	-0.333	0.030	-11.169	0.000
F1	38.141	0.114	334.196	0.000
close1	0.000			



close3	0.000
close4	0.000
close5	0.000
close6	0.000

Variances:

close1 (e_y)	3.696	0.103	35.728	0.000
close3 (e_y)	3.696	0.103	35.728	0.000
close4 (e_y)	3.696	0.103	35.728	0.000
close5 (e_y)	3.696	0.103	35.728	0.000
close6 (e_y)	3.696	0.103	35.728	0.000
F1	2.956	0.284	10.399	0.000
F2	0.136	0.020	6.804	0.000

The output for the linear model with a covariate and with unequal error variance in Figure 3b is given below.

Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	58.463	
Degrees of freedom	13	
p-value	0	
Chi-square statistic (baseline model)	2148.6	
Degrees of freedom (baseline model)	19	
CFI	0.979	
NFI	0.973	
NNFI	0.969	
RMSEA	0.064	

Fit for covariance only

Chi-square statistic	53.862	
Degrees of freedom	10	
p-value	0	
Chi-square statistic (baseline model)	1977.8	
Degrees of freedom (baseline model)	15	
CFI	0.978	
NFI	0.973	
NNFI	0.966	
RMSEA	0.072	

Fit for mean only

Chi-square statistic	4.606	
Degrees of freedom	3	
p-value	0.203	
Chi-square statistic (baseline model)	285	
Degrees of freedom (baseline model)	4	
CFI	0.994	
NFI	0.984	
NNFI	0.992	
RMSEA	0.025	

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
close1	1.000			
close3	1.000			
close4	1.000			

```

      close5          1.000
      close6          1.000
F2 =~
      close1          0.000
      close3          2.000
      close4          3.000
      close5          4.000
      close6          5.000

Regressions:
F1 ~
  gender          -0.274    0.162   -1.685    0.092
F2 ~
  gender          -0.052    0.043   -1.224    0.221

Covariances:
F1 ~~
  F2              0.242    0.065    3.713    0.000

Intercepts:
F2              -0.330    0.030   -11.108    0.000
F1              38.128    0.114   335.599    0.000
close1          0.000
close3          0.000
close4          0.000
close5          0.000
close6          0.000

Variances:
close1 (e_y1)    3.522    0.275   12.811    0.000
close3 (e_y2)    2.986    0.182   16.385    0.000
close4 (e_y3)    4.000    0.236   16.945    0.000
close5 (e_y4)    3.660    0.238   15.411    0.000
close6 (e_y5)    4.504    0.318   14.145    0.000
F1              3.051    0.301   10.148    0.000
F2              0.127    0.023    5.607    0.000

```

The output for the nonlinear model with a covariate and with equal error variance in Figure 3c is given below.

---

```

Test Statistics and Fit Indices
Fit for both mean and covariance
  Chi-square statistic    78.959
  Degrees of freedom      14
  p-value                 0
  Chi-square statistic (baseline model) 2272.4
  Degrees of freedom (baseline model) 23
  CFI                     0.971
  NFI                     0.965
  NNFI                    0.953
  RMSEA                   0.074
Fit for covariance only
  Chi-square statistic    75.991
  Degrees of freedom      11
  p-value                 0

```

Chi-square statistic (baseline model) 2107.8  
 Degrees of freedom (baseline model) 19  
 CFI 0.969  
 NFI 0.964  
 NNFI 0.946  
 RMSEA 0.083

Fit for mean only

Chi-square statistic 2.972  
 Degrees of freedom 3  
 p-value 0.396  
 Chi-square statistic (baseline model) 285.6  
 Degrees of freedom (baseline model) 4  
 CFI 1  
 NFI 0.99  
 NNFI 1  
 RMSEA 0

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
close1	1.000			
close3	1.000			
close4	1.000			
close5	1.000			
close6	1.000			
F2 =~				
close1	0.000			
close3	2.000			
close4	3.043	0.285	10.677	0.000
close5	4.027	0.374	10.769	0.000
close6	5.413	0.511	10.601	0.000
Regressions:				
F1 ~				
gender	-0.289	0.163	-1.781	0.075
F2 ~				
gender	-0.050	0.040	-1.238	0.216
Covariances:				
F1 ~~				
F2	0.235	0.056	4.225	0.000
Intercepts:				
F2	-0.312	0.043	-7.274	0.000
F1	38.114	0.117	325.411	0.000
close1	0.000			
close3	0.000			
close4	0.000			
close5	0.000			
close6	0.000			
Variances:				
close1 (e_y)	3.683	0.104	35.490	0.000
close3 (e_y)	3.683	0.104	35.490	0.000

close4	(e_y)	3.683	0.104	35.490	0.000
close5	(e_y)	3.683	0.104	35.490	0.000
close6	(e_y)	3.683	0.104	35.490	0.000
F1		3.035	0.295	10.302	0.000
F2		0.122	0.030	4.056	0.000

The output for the nonlinear model with a covariate and with equal error variance in Figure 3d is given below.

---

Test Statistics and Fit Indices

Fit for both mean and covariance

Chi-square statistic	57.928		
Degrees of freedom	10		
p-value	0		
Chi-square statistic (baseline model)		2148.6	
Degrees of freedom (baseline model)		19	
CFI	0.977		
NFI	0.973		
NNFI	0.957		
RMSEA	0.075		

Fit for covariance only

Chi-square statistic	54.587		
Degrees of freedom	7		
p-value	0		
Chi-square statistic (baseline model)		1977.8	
Degrees of freedom (baseline model)		15	
CFI	0.976		
NFI	0.972		
NNFI	0.948		
RMSEA	0.089		

Fit for mean only

Chi-square statistic	3.345		
Degrees of freedom	3		
p-value	0.341		
Chi-square statistic (baseline model)		284.99	
Degrees of freedom (baseline model)		4	
CFI	0.999		
NFI	0.988		
NNFI	0.998		
RMSEA	0.012		

Parameter Estimates

	Estimate	Std.err	Z-value	P(> z )
Latent variables:				
F1 =~				
close1	1.000			
close3	1.000			
close4	1.000			
close5	1.000			
close6	1.000			
F2 =~				
close1	0.000			
close3	2.000			
close4	2.988	0.266	11.245	0.000
close5	3.961	0.348	11.397	0.000
close6	5.138	0.464	11.075	0.000

Regressions:				
F1 ~				
gender	-0.274	0.162	-1.687	0.092
F2 ~				
gender	-0.052	0.042	-1.233	0.218
Covariances:				
F1 ~~				
F2	0.239	0.066	3.606	0.000
Intercepts:				
F2	-0.326	0.043	-7.541	0.000
F1	38.120	0.117	325.996	0.000
close1	0.000			
close3	0.000			
close4	0.000			
close5	0.000			
close6	0.000			
Variances:				
close1	3.523	0.275	12.817	0.000
close3	2.987	0.183	16.368	0.000
close4	4.009	0.239	16.763	0.000
close5	3.690	0.244	15.130	0.000
close6	4.431	0.340	13.033	0.000
F1	3.072	0.309	9.953	0.000
F2	0.124	0.032	3.863	0.000

---