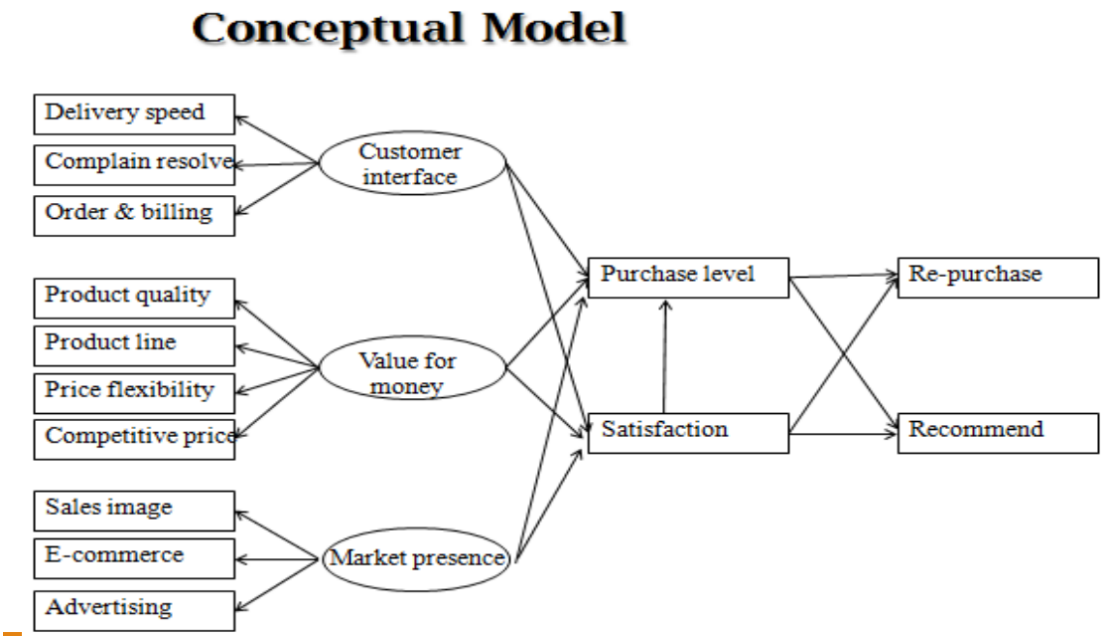
5/11--个人作业：

个人作业要求

使用 HBAT.SAV 数据文件，根据“调节效应.pptx”第 6 页的模型，用 Mplus 进行分析。提交 word 版的结果报告。结果报告中应包括：

1. 所用的 Mplus 语句
2. 所用的分析方法，分析结果（结合图表呈现），以及结果解释【重点】

*model 图 ：



结果报告

0. 数据描述：

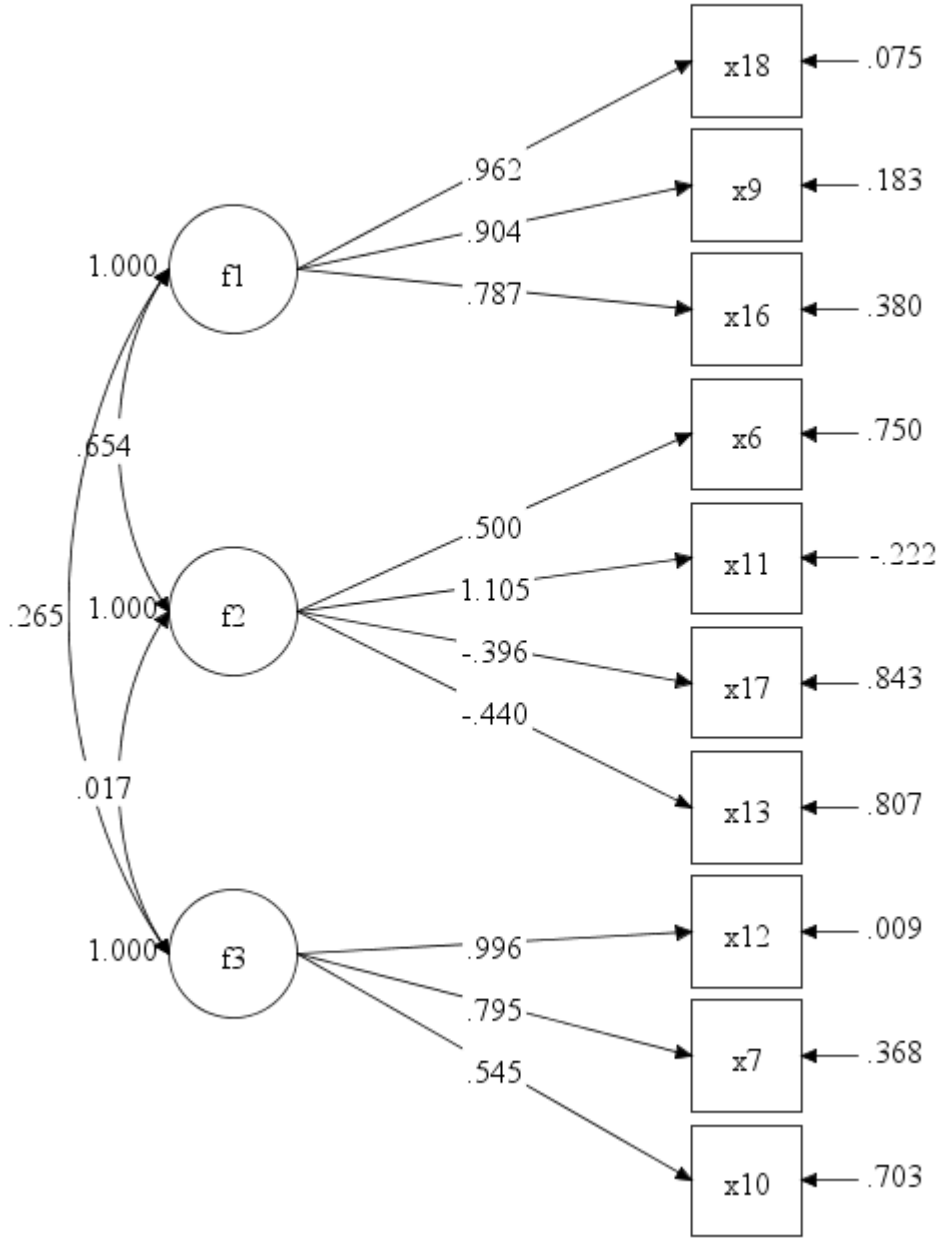
用到的均为连续数据，无缺失值

一．分析测量模型

1. 验证性因素分析 CFA（针对测量模型部分）

1.1 code：F:\course\MA1-2\统计_心理学院刘红云\week10 中介&调节\个人作业\cfa.inp

```
TITLE:      this is an example of a CFA with
            continuous factor indicators
DATA:       FILE IS HBAT.dat;
VARIABLE:       NAMES = id x1-x23;
                usevar = x18 x9 x16    x6 x11 x17 x13    x12 x7 x10

MODEL:   f1 BY x18 x9 x16;
      f2 BY x6 x11 x17 x13;
      f3 by x12 x7 x10 ;

OUTPUT:  MODINDICES(4) STANDARDIZED;
```



出现错误提示：‘NO CONVERGENCE. NUMBER OF ITERATIONS EXCEEDED.’
但可以画出模型图，根据图中 STDYX 的 loading 值，发现 x17<0.4，删除后重新 cfa。

1.2：删除 x17，CFA

Chi-Square Test of Model Fit

Value	43.942
Degrees of Freedom	24
P-Value	0.0078

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.091	
90 Percent C.I.	0.046	0.133
Probability RMSEA <= .05	0.063	

CFI/TLI

CFI	0.959
TLI	0.939

STANDARDIZED MODEL RESULTS

STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	BY				
X18		0.961	0.022	44.356	0.000
X9		0.905	0.027	32.970	0.000
X16		0.788	0.043	18.374	0.000
F2	BY				
X6		0.381	0.091	4.197	0.000
X11		1.222	0.145	8.418	0.000
X13		-0.377	0.096	-3.919	0.000
F3	BY				
X12		0.995	0.048	20.863	0.000
X7		0.795	0.052	15.397	0.000
X10		0.545	0.077	7.120	0.000

MODEL MODIFICATION INDICES

NOTE: Modification indices for direct effects of observed dependent variables regressed on covariates may not be included. To include these, request MODINDICES (ALL).

Minimum M.I. value for printing the modification index 4.000

		M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.
BY Statements					
F1	BY X6	4.854	-0.594	-0.417	-0.300
F1	BY X11	19.585	4.170	2.929	2.238
F2	BY X18	5.913	0.164	0.087	0.119
F2	BY X16	5.461	-0.226	-0.119	-0.129
F3	BY X11	9.418	0.757	0.804	0.614
F3	BY X13	7.985	0.370	0.393	0.255
WITH Statements					
X9	WITH X18	5.874	-0.150	-0.150	-1.460
X16	WITH X9	7.871	0.136	0.136	0.466
X6	WITH X18	10.359	-0.131	-0.131	-0.505
X11	WITH X18	13.382	0.122	0.122	999.000
X11	WITH X16	7.940	-0.135	-0.135	999.000
X13	WITH X18	5.569	0.106	0.106	0.370
X13	WITH X6	10.410	-0.633	-0.633	-0.346

RMSE>0.05;x6,x13loading 值<0.04,根据修正指数提示，增加约束 X11 WITH X18.

1.3 增加约束 X11 WITH X18，重新 CFA

Chi-Square Test of Model Fit

Value	31.347
Degrees of Freedom	23
P-Value	0.1145

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.060	
90 Percent C.I.	0.000	0.109
Probability RMSEA <= .05	0.346	

CFI/TLI

CFI	0.983
TLI	0.973

STANDARDIZED MODEL RESULTS

STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	BY				
X18		0.919	0.026	36.013	0.000
X9		0.934	0.024	39.349	0.000
X16		0.816	0.038	21.430	0.000
F2	BY				
X6		0.461	0.092	5.030	0.000
X11		1.099	0.109	10.097	0.000
X13		-0.446	0.096	-4.635	0.000
F3	BY				
X12		0.993	0.047	21.158	0.000
X7		0.796	0.051	15.576	0.000
X10		0.546	0.076	7.145	0.000

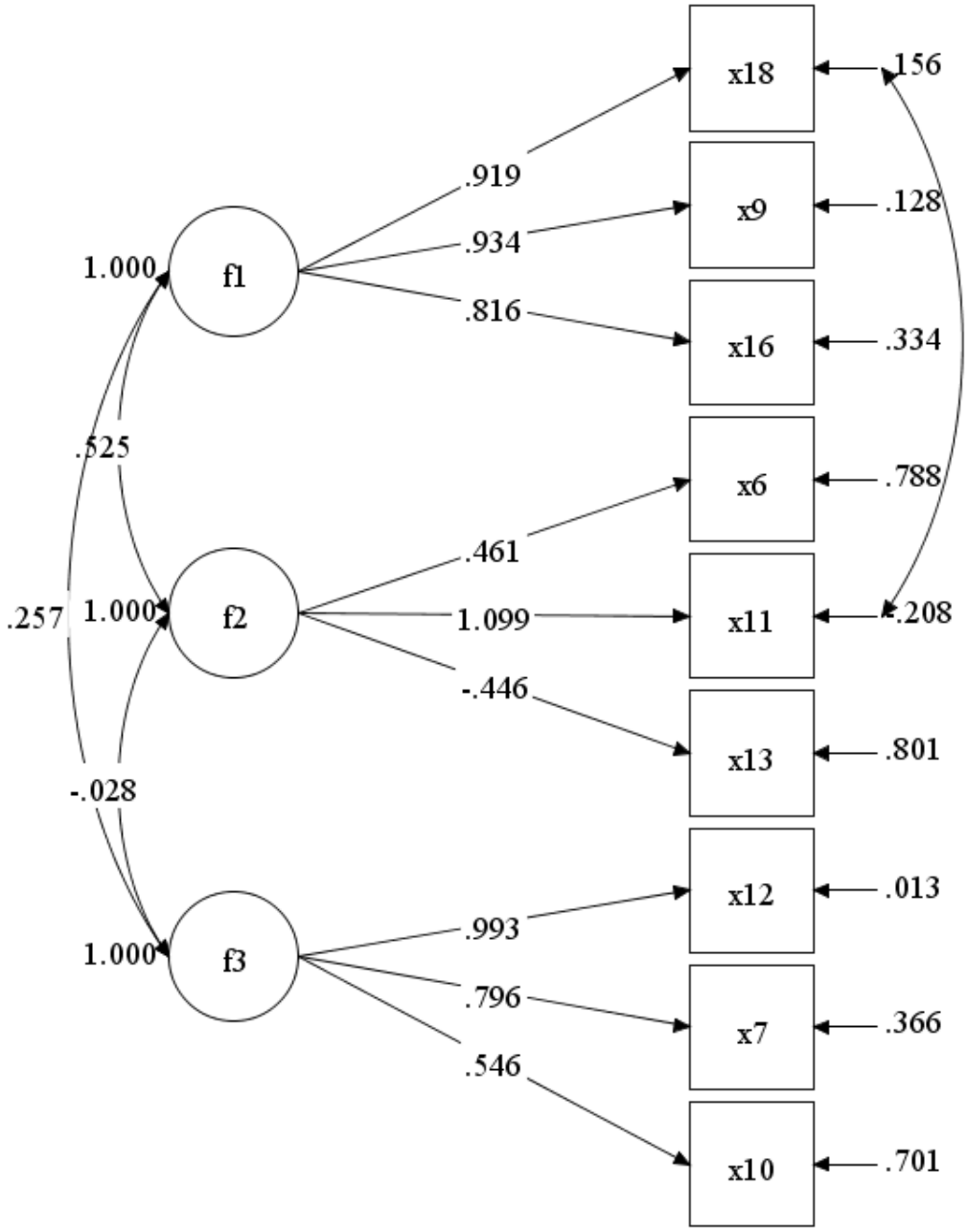
MODEL MODIFICATION INDICES

NOTE: Modification indices for direct effects of observed dependent variables regressed on covariates may not be included. To include these, request MODINDICES (ALL).

Minimum M.I. value for printing the modification index 4.000

		M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.
BY Statements					
F1	BY X6	5.352	-0.611	-0.404	-0.291
F1	BY X11	16.559	2.533	1.676	1.249
F2	BY X9	5.142	0.263	0.168	0.140
F3	BY X11	8.499	0.535	0.567	0.423
F3	BY X13	7.529	0.348	0.369	0.240
WITH Statements					
X11	WITH X9	4.953	0.153	0.153	999.000
X13	WITH X6	7.859	-0.541	-0.541	-0.319
X10	WITH X18	4.253	0.059	0.059	0.222

RMSE 值改善接近 0.05；x6，x13loading 提高（>0.4）；再增加约束 model 没有改善，最终采用此模型。



2. 总结

步骤	Chi-square	Df	RMSEA	CFI	TLI	△ Chi-square	△df	P-value
1 原模型								
2.删除 x17	43.942	24	0.091	0.959	0.939			
3.限定 X11 WITH X18	31.347	23	0.060	0.983	0.973	12.595	1	<0.05

一．分析结构模型

1.

1.1 code

```
TITLE:      aiming at structure model
DATA:       FILE IS HBAT.dat;
VARIABLE:       NAMES = id x1-x23;
                usevar =x18 x9 x16    x6 x11    x13    x12 x7 x10 x22 x21 x19 x20

MODEL:
      f1 BY x18 x9 x16 ;
      f2 BY x6 x11    x13;
      f3 by x12 x7 x10 ;
 X11          WITH X18;



 x22 on f1 f2 f3 x19;
          x19 on f1 f2 f3;

            x21 on x22 x19;
            x20 on x22 x19;

      f1 with f2;
      f1 with f3;
      f2 with f3;
OUTPUT:modindices(4)   stdyx;
```

1.2 output

```
Chi-Square Test of Model Fit

          Value                            116.010
          Degrees of Freedom                53
          P-Value                          0.0000

RMSEA (Root Mean Square Error Of Approximation)

          Estimate                          0.109
          90 Percent C.I.                   0.082  0.136
          Probability RMSEA <= .05          0.000

CFI/TLI

          CFI                               0.934
          TLI                               0.903
```

MODEL MODIFICATION INDICES

NOTE: Modification indices for direct effects of observed dependent variables regressed on covariates may not be included. To include these, request MODINDICES (ALL).

Minimum M.I. value for printing the modification index 4.000

		M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.
BY Statements					
F1	BY X6	17.887	-0.984	-0.615	-0.443
F1	BY X11	31.192	1.138	0.711	0.524
F1	BY X10	4.368	0.336	0.210	0.187
WITH Statements					
X16	WITH X9	12.711	0.156	0.156	0.426
X6	WITH X18	7.373	-0.082	-0.082	-0.587
X11	WITH X9	20.156	0.394	0.394	0.636
X13	WITH X11	11.087	-0.428	-0.428	-0.317

1.3 增加约束 X11 WITH X9

Chi-Square Test of Model Fit

Value	87.252	
Degrees of Freedom	52	
P-Value	0.0016	

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.082	
90 Percent C.I.	0.051	0.112
Probability RMSEA <= .05	0.047	

CFI/TLI

CFI	0.963
TLI	0.944

STANDARDIZED MODEL RESULTS

STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	BY				
X18		0.959	0.020	47.014	0.000
X9		0.878	0.029	30.522	0.000
X16		0.705	0.052	13.440	0.000
F2	BY				
X6		0.806	0.037	21.518	0.000
X11		0.728	0.050	14.429	0.000
X13		-0.455	0.082	-5.567	0.000
F3	BY				
X12		1.070	0.033	32.664	0.000
X7		0.744	0.047	15.869	0.000
X10		0.479	0.077	6.222	0.000

Minimum M.I. value for printing the modification index 4.000

		M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.
BY Statements					
F1	BY X6	5.048	-0.514	-0.326	-0.235
F1	BY X11	14.522	0.935	0.593	0.436
F1	BY X10	5.283	0.326	0.207	0.184
WITH Statements					
X16	WITH X9	4.891	0.096	0.096	0.276
X6	WITH X18	5.347	-0.074	-0.074	-0.483
X11	WITH X16	11.683	0.297	0.297	0.486
X11	WITH X6	7.038	-0.417	-0.417	-0.543
X13	WITH X11	6.197	-0.303	-0.303	-0.237

1.4 增加约束 X11 WITH X16

Chi-Square Test of Model Fit

Value	74.315	
Degrees of Freedom	51	
P-Value	0.0182	

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.068	
90 Percent C.I.	0.029	0.099
Probability RMSEA <= .05	0.191	

CFI/TLI

CFI	0.975
TLI	0.963

STANDARDIZED MODEL RESULTS

STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	BY				
X18		0.962	0.018	54.350	0.000
X9		0.892	0.026	34.329	0.000
X16		0.777	0.042	18.416	0.000
F2	BY				
X6		0.756	0.047	15.995	0.000
X11		0.762	0.048	15.754	0.000
X13		-0.407	0.086	-4.716	0.000
F3	BY				
X12		1.069	0.033	32.792	0.000
X7		0.745	0.047	15.918	0.000
X10		0.481	0.077	6.239	0.000

Minimum M.I. value for printing the modification index 4.000

		M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.
BY Statements					
F1	BY X11	4.204	0.772	0.519	0.388
F1	BY X10	5.612	0.285	0.191	0.171
WITH Statements					
X16	WITH X9	5.766	0.096	0.096	0.320
X6	WITH X18	5.248	-0.073	-0.073	-0.421
X11	WITH X6	10.100	-0.569	-0.569	-0.723
X13	WITH X11	4.499	-0.262	-0.262	-0.216

1.5 增加约束 x11 with x6

Chi-Square Test of Model Fit

Value	60.596	
Degrees of Freedom	50	
P-Value	0.1449	

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.046	
90 Percent C.I.	0.000	0.083
Probability RMSEA <= .05	0.537	

CFI/TLI

CFI	0.989
TLI	0.983

STANDARDIZED MODEL RESULTS

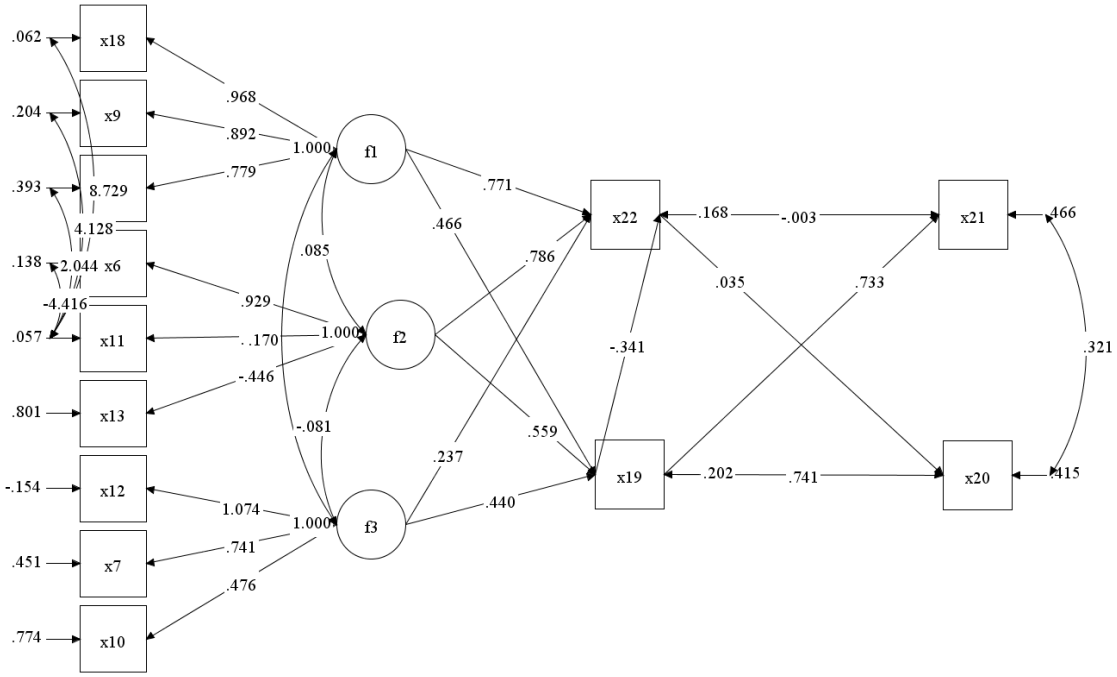
STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	BY				
X18		0.968	0.016	62.051	0.000
X9		0.892	0.025	35.743	0.000
X16		0.779	0.042	18.506	0.000
F2	BY				
X6		0.929	0.057	16.155	0.000
X11		0.971	0.079	12.267	0.000
X13		-0.446	0.072	-6.190	0.000
F3	BY				
X12		1.074	0.035	30.986	0.000
X7		0.741	0.048	15.540	0.000
X10		0.476	0.078	6.134	0.000

```
MODEL MODIFICATION INDICES

NOTE:  Modification indices for direct effects of observed dependent variables
regressed on covariates may not be included.  To include these, request
MODINDICES (ALL).

Minimum M.I. value for printing the modification index     4.000

                                  M.I.      E.P.C.   Std E.P.C.   StdYX E.P.C.

BY Statements

F1       BY X10                  5.749      0.259      0.180        0.160
F3       BY X13                  6.286      0.270      0.310        0.201

WITH Statements

X16      WITH X9                 6.459      0.099      0.099        0.323
X6       WITH X18                6.598     -0.081     -0.081       -0.878
```

3. 总结

Model	Chi-square	Df	RMSE	CFI	TLI	△Chi-square	△df	P-value
M1	116.01	53	0.109	0.934	0.903			
M2 x11 with x9	87.252	52	0.082	0.963	0.944	28.758	1	<0.05
M3 X11 with x16	74.315	51	0.068	0.975	0.963	12.937	1	<0.05
M4 x11 with x6	60.596	50	0.046	0.989	0.983	13.719	1	<0.05



问题：

1. 先确定测量模型（已拟合好），再确定结构模型，在修订结构模型时，修正指数提示测量模型部分可修订，是否可以再改测量模型；
2. NO CONVERGENCE. NUMBER OF ITERATIONS EXCEEDED.不迭代后，不显示个拟合指标 eg：chi-square 但结构图中可显示 stdyx 的 loading 值，只根据图删题是否可以？

3.关于一题对应多因子的问题，数据上拟合上能改善是否可采用，若采用该怎么样解释？这个题很通用高效？