```
------------------------------------------------------------------------------------------------------------------------
      name:  <unnamed>
       log:  D:\jason\workshop\Latent Class Analysis\lca3.log
  log type:  text
 opened on:   8 Dec 2020, 15:37:45

.
.
.
. ***************************************
. * Model Comparison
. ***************************************
.
. use https://www.stata-press.com/data/r16/gsem_lca1, clear
(Latent class analysis)

.
. des

Contains data from https://www.stata-press.com/data/r16/gsem_lca1.dta
  obs:           216                          Latent class analysis
 vars:             4                          17 Jan 2019 12:52
 size:           864                          (_dta has notes)
------------------------------------------------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
------------------------------------------------------------------------------------------------------------------------
accident        byte    %9.0g                 would testify against friend in accident case
play            byte    %9.0g                 would give negative review of friend's play
insurance       byte    %9.0g                 would disclose health concerns to friend's insurance company
stock           byte    %9.0g                 would keep company secret from friend
------------------------------------------------------------------------------------------------------------------------
Sorted by: accident  play  insurance  stock

. sum

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    accident |        216    .7916667    .4070598          0          1
        play |        216          .5    .5011614          0          1
   insurance |        216    .5138889    .5009681          0          1
       stock |        216    .3101852    .4636438          0          1

.
.
. quietly: gsem (accident play insurance stock <- ), logit lclass(C 1)

. estat lcgof

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
         chi2_ms(11) |     81.084   model vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   1095.300   Akaike's information criterion
                 BIC |   1108.801   Bayesian information criterion
------------------------------------------------------------------------------

. estimates store oneclass

.
. quietly: gsem (accident play insurance stock <- ), logit lclass(C 2)

. estat lcgof

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(6) |      2.720   model vs. saturated
            p > chi2 |      0.843
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   1026.935   Akaike's information criterion
                 BIC |   1057.313   Bayesian information criterion
------------------------------------------------------------------------------

. estimates store twoclass

.
. quietly: gsem (accident play insurance stock <- ), logit lclass(C 3)
```

```
. estat lcgof

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(1) |      0.387   model vs. saturated
            p > chi2 |      0.534
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   1034.602   Akaike's information criterion
                 BIC |   1081.856   Bayesian information criterion
------------------------------------------------------------------------------

. estimates store threeclass

.
. estimates stats oneclass twoclass threeclass

Akaike's information criterion and Bayesian information criterion

------------------------------------------------------------------------------------
       Model |        Obs  ll(null)  ll(model)      df         AIC         BIC
-------------+----------------------------------------------------------------------
    oneclass |        216         .  -543.6498       4      1095.3   1108.801
    twoclass |        216         .  -504.4677       9    1026.935   1057.313
  threeclass |        216         .  -503.3011      14    1034.602   1081.856
------------------------------------------------------------------------------------
               Note: N=Obs used in calculating BIC; see [R] BIC note.

.
.
. ****************************************
. * Interpretation of the best fitting model
. ****************************************
.
. use https://www.stata-press.com/data/r16/gsem_lca1, clear
(Latent class analysis)

.
.
. gsem (accident play insurance stock <- ), logit lclass(C 2)

Fitting class model:

Iteration 0:   (class) log likelihood = -149.71979
Iteration 1:   (class) log likelihood = -149.71979

Fitting outcome model:

Iteration 0:   (outcome) log likelihood = -403.97142
Iteration 1:   (outcome) log likelihood = -398.15909
Iteration 2:   (outcome) log likelihood = -397.81953
Iteration 3:   (outcome) log likelihood =  -397.8164
Iteration 4:   (outcome) log likelihood =  -397.8164

Refining starting values:

Iteration 0:   (EM) log likelihood = -570.24204
Iteration 1:   (EM) log likelihood = -576.20485
Iteration 2:   (EM) log likelihood = -577.41464
Iteration 3:   (EM) log likelihood = -576.88554
Iteration 4:   (EM) log likelihood = -575.59242
Iteration 5:   (EM) log likelihood = -573.90567
Iteration 6:   (EM) log likelihood = -571.99868
Iteration 7:   (EM) log likelihood = -569.97482
Iteration 8:   (EM) log likelihood = -567.90955
Iteration 9:   (EM) log likelihood = -565.86392
Iteration 10:  (EM) log likelihood = -563.88815
Iteration 11:  (EM) log likelihood = -562.02165
Iteration 12:  (EM) log likelihood = -560.29231
Iteration 13:  (EM) log likelihood = -558.71641
Iteration 14:  (EM) log likelihood = -557.29974
Iteration 15:  (EM) log likelihood = -556.03949
Iteration 16:  (EM) log likelihood = -554.92679
Iteration 17:  (EM) log likelihood = -553.94914
Iteration 18:  (EM) log likelihood = -553.09241
Iteration 19:  (EM) log likelihood = -552.34233
Iteration 20:  (EM) log likelihood = -551.68539
Note: EM algorithm reached maximum iterations.

Fitting full model:
```

```
Iteration 0:   log likelihood = -504.62913
Iteration 1:   log likelihood = -504.47255
Iteration 2:   log likelihood = -504.46773
Iteration 3:   log likelihood = -504.46767
Iteration 4:   log likelihood = -504.46767

Generalized structural equation model           Number of obs     =        216
Log likelihood = -504.46767

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
1.C          |  (base outcome)
-------------+----------------------------------------------------------------
2.C          |
       _cons |  -.9482041   .2886333    -3.29   0.001    -1.513915   -.3824933
------------------------------------------------------------------------------

Class          : 1

Response       : accident
Family         : Bernoulli
Link           : logit

Response       : play
Family         : Bernoulli
Link           : logit

Response       : insurance
Family         : Bernoulli
Link           : logit

Response       : stock
Family         : Bernoulli
Link           : logit

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
accident     |
       _cons |   .9128742   .1974695     4.62   0.000     .5258411    1.299907
-------------+----------------------------------------------------------------
play         |
       _cons |  -.7099072   .2249096    -3.16   0.002    -1.150722   -.2690926
-------------+----------------------------------------------------------------
insurance    |
       _cons |  -.6014307   .2123096    -2.83   0.005     -1.01755   -.1853115
-------------+----------------------------------------------------------------
stock        |
       _cons |  -1.880142   .3337665    -5.63   0.000    -2.534312   -1.225972
------------------------------------------------------------------------------

Class          : 2

Response       : accident
Family         : Bernoulli
Link           : logit

Response       : play
Family         : Bernoulli
Link           : logit

Response       : insurance
Family         : Bernoulli
Link           : logit

Response       : stock
Family         : Bernoulli
Link           : logit

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
accident     |
       _cons |   4.983017   3.745987     1.33   0.183    -2.358982    12.32502
-------------+----------------------------------------------------------------
play         |
       _cons |   2.747366   1.165853     2.36   0.018     .4623372    5.032395
-------------+----------------------------------------------------------------
insurance    |
       _cons |   2.534582   .9644841     2.63   0.009     .6442279    4.424936
-------------+----------------------------------------------------------------
stock        |
       _cons |   1.203416   .5361735     2.24   0.025     .1525356    2.254297
```

```
------------------------------------------------------------------------------

.
. estat lcprob

Latent class marginal probabilities             Number of obs     =        216

--------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.     [95% Conf. Interval]
-------------+------------------------------------------------
           C |
          1  |   .7207539   .0580926      .5944743    .8196407
          2  |   .2792461   .0580926      .1803593    .4055257
--------------------------------------------------------------

.
. estat lcmean

Latent class marginal means                     Number of obs     =        216

--------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.     [95% Conf. Interval]
-------------+------------------------------------------------
1            |
    accident |   .7135879   .0403588      .6285126    .7858194
        play |   .3296193   .0496984      .2403573    .4331299
   insurance |   .3540164   .0485528      .2655049    .4538042
       stock |   .1323726   .0383331      .0734875    .2268872
-------------+------------------------------------------------
2            |
    accident |   .9931933   .0253243      .0863544    .9999956
        play |   .9397644   .0659957      .6135685    .9935191
   insurance |   .9265309   .0656538      .6557086    .9881667
       stock |    .769132   .0952072      .5380601    .9050206
--------------------------------------------------------------

.
. predict classpost*, classposteriorpr

.
.
.
. ***********************************************************
. * Use Margins and Marginsplot to present the LCA results
. ***********************************************************
.
. use https://www.stata-press.com/data/r16/gsem_lca1, clear
(Latent class analysis)

.
.
. quietly: gsem (accident play insurance stock <- ), logit lclass(C 2)

.
. margins, predict(classpr class(1)) predict(classpr class(2))
Warning: prediction constant over observations.
Warning: prediction constant over observations.

Predictive margins                              Number of obs     =        216
Model VCE    : OIM

1._predict   : Predicted probability (1.C), predict(classpr class(1))
2._predict   : Predicted probability (2.C), predict(classpr class(2))

------------------------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    _predict |
          1  |   .7207539   .0580926    12.41   0.000     .6068945    .8346132
          2  |   .2792461   .0580926     4.81   0.000     .1653868    .3931055
------------------------------------------------------------------------------

.
. marginsplot, xtitle ("") ytitle ("")     ///
> xlabel (1 "Class 1" 2 "Class 2" )  ///
> title("Predicted Latent Class Probabilities with 95% CI")

  Variables that uniquely identify margins: _equation

.
.
```

```
. margins, predict(classpr class(1)) predict(classpr class(2))
Warning: prediction constant over observations.
Warning: prediction constant over observations.

Predictive margins                                Number of obs     =        216
Model VCE    : OIM

1._predict   : Predicted probability (1.C), predict(classpr class(1))
2._predict   : Predicted probability (2.C), predict(classpr class(2))

------------------------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    _predict |
           1 |   .7207539   .0580926    12.41   0.000     .6068945    .8346132
           2 |   .2792461   .0580926     4.81   0.000     .1653868    .3931055
------------------------------------------------------------------------------


.
. marginsplot, recast(bar) xtitle ("") ytitle ("") ///
> xlabel (1 "Class 1" 2 "Class 2" )     ///
> title("Predicted Latent Class Probabilities with 95% CI")

  Variables that uniquely identify margins: _equation

.
.
. margins, predict(outcome(accident) class(1)) ///
> predict(outcome(play) class(1)) ///
> predict(outcome(insurance) class(1)) ///
> predict(outcome(stock) class(1))
Warning: prediction constant over observations.
Warning: prediction constant over observations.
Warning: prediction constant over observations.
Warning: prediction constant over observations.

Predictive margins                                Number of obs     =        216
Model VCE    : OIM

1._predict   : Predicted mean (would testify against friend in accident case in class 1.C), predict(outcome(accident) cl
2._predict   : Predicted mean (would give negative review of friend's play in class 1.C), predict(outcome(play) class(1)
3._predict   : Predicted mean (would disclose health concerns to friend's insurance company in , predict(outcome(insuran
4._predict   : Predicted mean (would keep company secret from friend in class 1.C), predict(outcome(stock) class(1))

------------------------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    _predict |
           1 |   .7135879   .0403588    17.68   0.000     .6344861    .7926898
           2 |   .3296193   .0496984     6.63   0.000     .2322123    .4270263
           3 |   .3540164   .0485528     7.29   0.000     .2588547    .4491782
           4 |   .1323726   .0383331     3.45   0.001     .0572411    .2075041
------------------------------------------------------------------------------


.
. marginsplot, recast(bar) xtitle ("") ytitle ("") ///
> xlabel (1 "accident" 2 "play" 3 "insurance" 4 "stock") ///
> title("Predicted Probability of Behaviors For Class 1 with 95% CI")  saving(graph1, replace)

  Variables that uniquely identify margins: _equation
(file graph1.gph saved)

.
. margins, predict(outcome(accident) class(2)) ///
> predict(outcome(play) class(2)) ///
> predict(outcome(insurance) class(2)) ///
> predict(outcome(stock) class(2))
Warning: prediction constant over observations.
Warning: prediction constant over observations.
Warning: prediction constant over observations.
Warning: prediction constant over observations.

Predictive margins                                Number of obs     =        216
Model VCE    : OIM

1._predict   : Predicted mean (would testify against friend in accident case in class 2.C), predict(outcome(accident) cl
2._predict   : Predicted mean (would give negative review of friend's play in class 2.C), predict(outcome(play) class(2)
3._predict   : Predicted mean (would disclose health concerns to friend's insurance company in , predict(outcome(insuran
4._predict   : Predicted mean (would keep company secret from friend in class 2.C), predict(outcome(stock) class(2))

------------------------------------------------------------------------------
             |            Delta-method
```

```
             |     Margin   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+------------------------------------------------------------------
    _predict |
           1  |   .9931933   .0253243    39.22   0.000     .9435586    1.042828
           2  |   .9397644   .0659957    14.24   0.000     .8104152    1.069114
           3  |   .9265309   .0656538    14.11   0.000     .7978518     1.05521
           4  |    .769132   .0952072     8.08   0.000     .5825292    .9557348
------------------------------------------------------------------------------

.
. marginsplot, recast(bar) xtitle ("") ytitle ("") ///
> xlabel (1 "accident" 2 "play" 3 "insurance" 4 "stock") ///
> title("Predicted Probability of Behaviors For Class 2 with 95% CI") saving(graph2, replace)

  Variables that uniquely identify margins: _equation
(file graph2.gph saved)

.
.
.
. log close
      name:  <unnamed>
       log:  D:\jason\workshop\Latent Class Analysis\lca3.log
  log type:  text
 closed on:   8 Dec 2020, 15:38:02
-------------------------------------------------------------------------------------------------------------------------------
```