Statistical Innovations Online course:

Latent Class Discrete Choice Modeling with Scale Factors

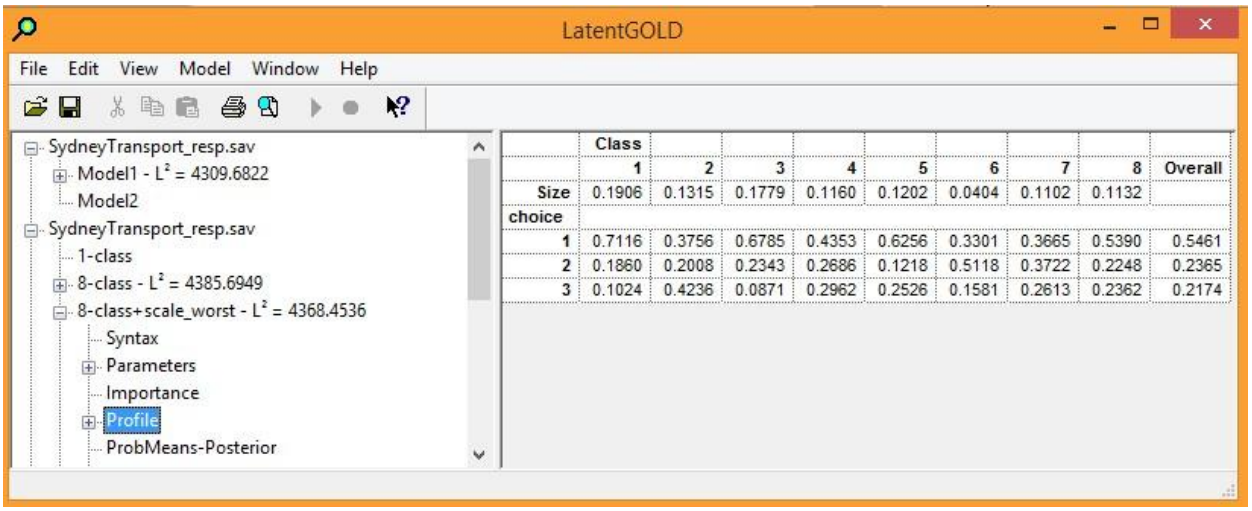
ANSWERS Session 3: Advanced SALC Topics

Question A1: As shown in Fig. 22 of this reading material: Assigned Reading Material 2 **, allowing correlation between 8 classes and the 2 scale classes increases the number of model parameters from 74 to 81. Examine the estimated correlation parameters in the Parameters Output for Model 5. Why are 81-74 = 7 distinct parameters required to allow for correlation rather than just 1 correlation parameter?**

Since there is an association estimated between each of the 8 classes (in which 1 is redundant) and the 2 scale classes (in which 1 is redundant). That is (8-1) x (2-1) = 7 association parameters.

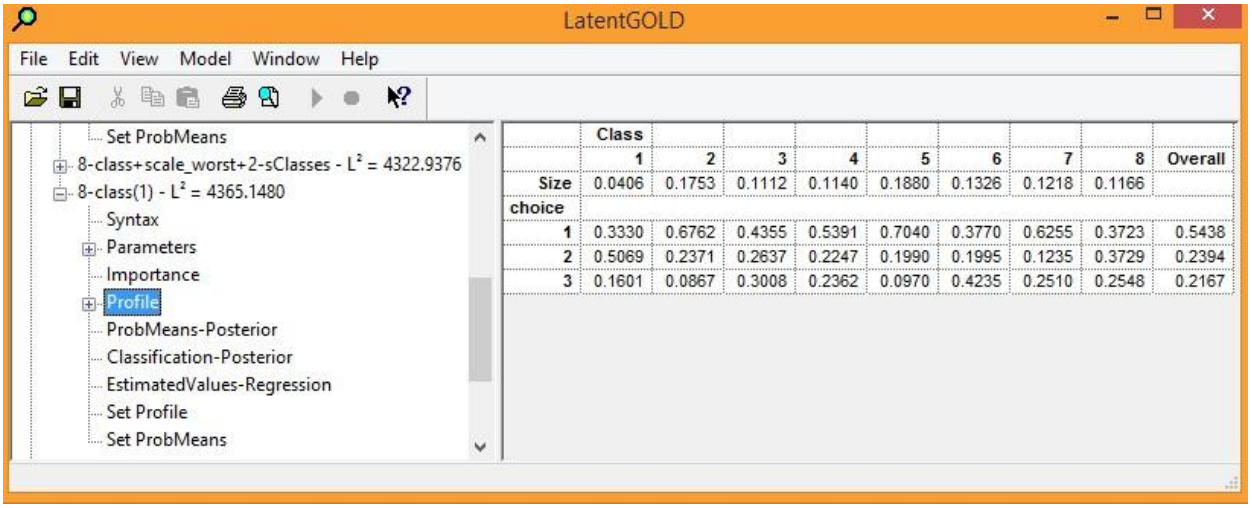
Question A2.1: Are the 8 classes obtained in the first model similar to the 8 classes obtained in the second model? Hint: Compare the Parameters Output from both models and also compare the size of the classes as shown in the Profile Output.

Yes, they are very similar. Since these models are estimated with the LG Syntax module, the order of the classes that you get may differ from what is shown below. For the 8-class model with different scale effect for the Worst responses, the class sizes are shown below.



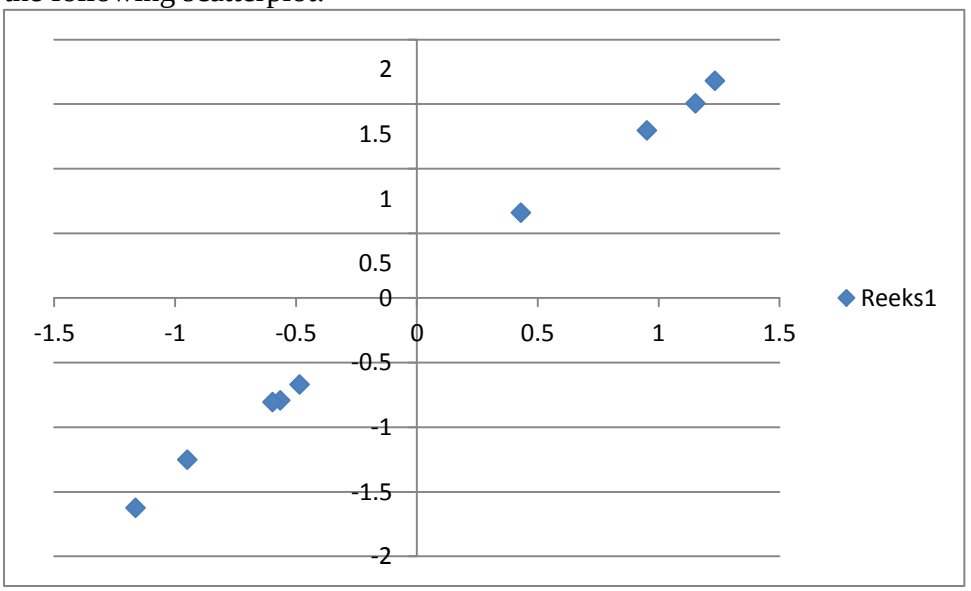
	Class								
	1	2	3	4	5	6	7	8	Overall
Size	0.1906	0.1315	0.1779	0.1160	0.1202	0.0404	0.1102	0.1132	
choice									
1	0.7116	0.3756	0.6785	0.4353	0.6256	0.3301	0.3665	0.5390	0.5461
2	0.1860	0.2008	0.2343	0.2686	0.1218	0.5118	0.3722	0.2248	0.2365
3	0.1024	0.4236	0.0871	0.2962	0.2526	0.1581	0.2613	0.2362	0.2174

For the 8-class ‘MaxDiff’ (joint BestWorst) model, the class sizes are shown below:



	Class								
	1	2	3	4	5	6	7	8	Overall
Size	0.0406	0.1753	0.1112	0.1140	0.1880	0.1326	0.1218	0.1166	
choice									
1	0.3330	0.6762	0.4355	0.5391	0.7040	0.3770	0.6255	0.3723	0.5438
2	0.5069	0.2371	0.2637	0.2247	0.1990	0.1995	0.1235	0.3729	0.2394
3	0.1601	0.0867	0.3008	0.2362	0.0970	0.4235	0.2510	0.2548	0.2167

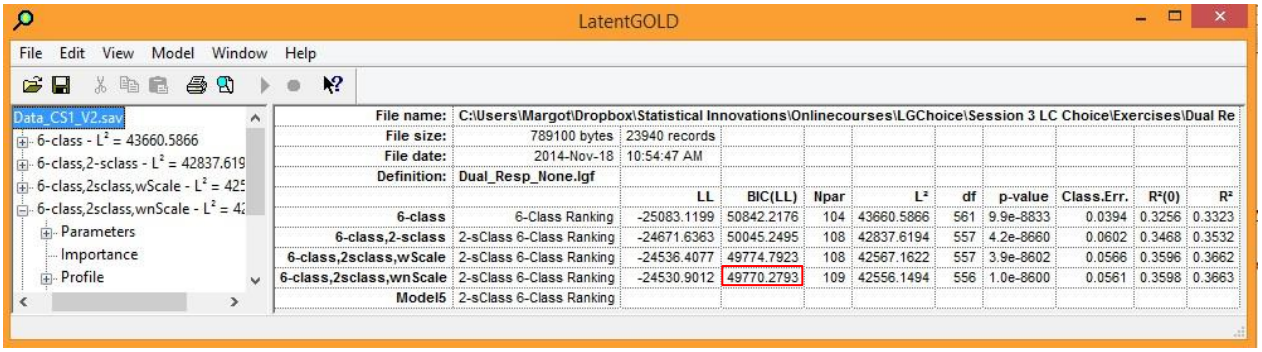
The correspondence between the classes in these models is: '1 – 5, 2- 6, 3 -2, 4-3, 5-7, 6-1, 7-8, 8-4'. That is, class 1 with class size .1906 in the first model corresponds to class 5 with size '.1880' in the second model shown above. The parameters associated with the corresponding classes from the 2 models are roughly proportional to each other. For example, plotting the parameter estimates from class 1 of the first model against class 5 of the second model we get the following scatterplot:



Question A2.2: Why do you think that allowing separate scale factors for Best and Worst in the Best-Worst model improves the fit of this model?

Because this correctly models the scale factors that are present in the population. Respondents show greater consistency in their first response (the Best response). Eliminating that alternative selected first yields remaining alternatives which may no longer differ so much in their preference.

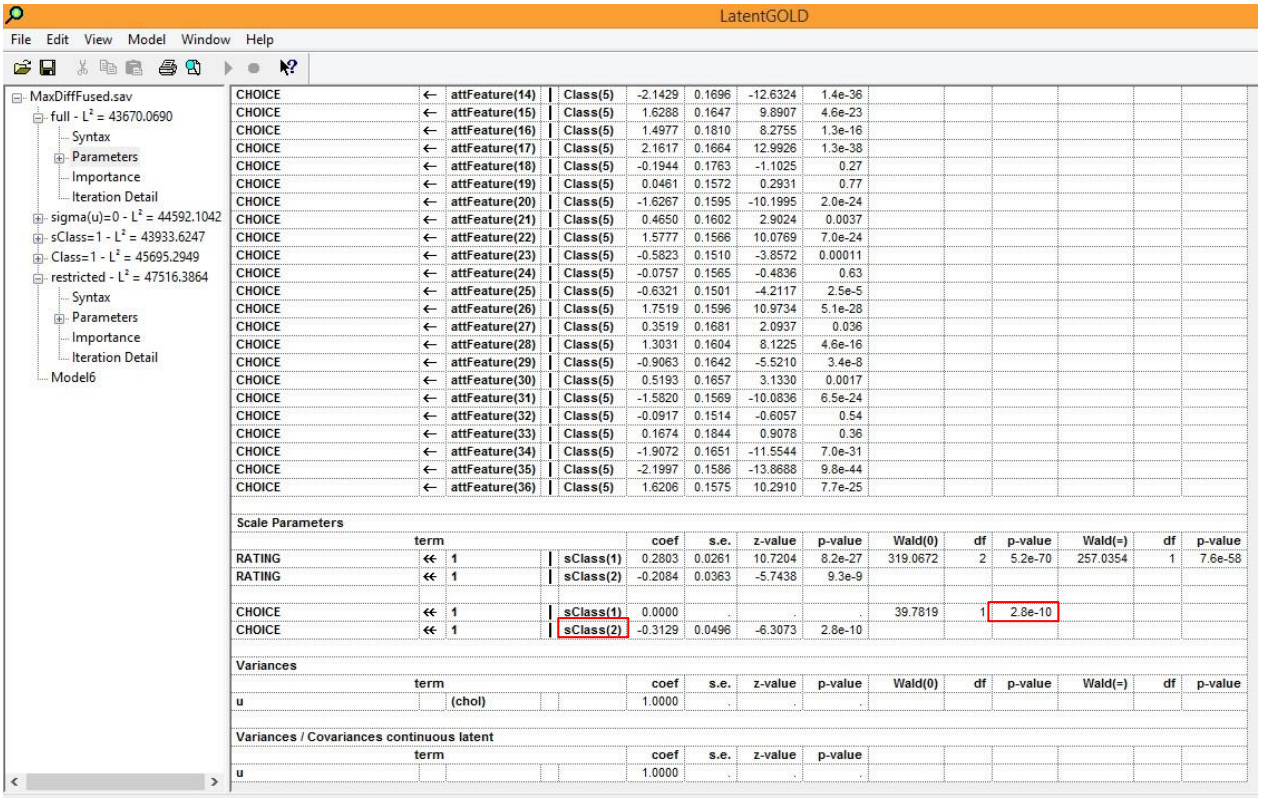
Question B1: Which model fits best?



		LL	BIC(LL)	Npar	L²	df	p-value	Class.Err.	R²(0)	R²
6-class	6-Class Ranking	-25083.1199	50842.2176	104	43660.5866	561	9.9e-8833	0.0394	0.3256	0.3323
6-class,2-sclass	2-sClass 6-Class Ranking	-24671.6363	50045.2495	108	42837.6194	557	4.2e-8660	0.0602	0.3468	0.3532
6-class,2sclass,wScale	2-sClass 6-Class Ranking	-24536.4077	49774.7923	108	42567.1622	557	3.9e-8602	0.0566	0.3596	0.3662
6-class,2sclass,wnScale	2-sClass 6-Class Ranking	-24530.9012	49770.2793	109	42556.1494	556	1.0e-8600	0.0561	0.3598	0.3663
Model5	2-sClass 6-Class Ranking									

The last model has the lowest BIC value and hence fits best.

Question C1.1: For the choice model, the scale factor is set to 1 (log-scale factor=0) for sClass(1), and the sClasses are ordered so that the higher scale factor is associated with sClass(1). What is the estimated scale factor for sClass(2)? Does it differ significantly from 1 (i.e., are the scale factors for the 2 scale classes significantly different from each other?)



CHOICE	←	attFeature(14)	Class(5)	-2.1429	0.1696	-12.6324	1.4e-36							
CHOICE	←	attFeature(15)	Class(5)	1.6288	0.1647	9.8907	4.6e-23							
CHOICE	←	attFeature(16)	Class(5)	1.4977	0.1810	8.2755	1.3e-16							
CHOICE	←	attFeature(17)	Class(5)	2.1617	0.1664	12.9926	1.3e-38							
CHOICE	←	attFeature(18)	Class(5)	-0.1944	0.1763	-1.1025	0.27							
CHOICE	←	attFeature(19)	Class(5)	0.0461	0.1572	0.2931	0.77							
CHOICE	←	attFeature(20)	Class(5)	-1.6267	0.1595	-10.1995	2.0e-24							
CHOICE	←	attFeature(21)	Class(5)	0.4650	0.1602	2.9024	0.0037							
CHOICE	←	attFeature(22)	Class(5)	1.5777	0.1566	10.0769	7.0e-24							
CHOICE	←	attFeature(23)	Class(5)	-0.5823	0.1510	-3.8572	0.00011							
CHOICE	←	attFeature(24)	Class(5)	-0.0757	0.1565	-0.4836	0.63							
CHOICE	←	attFeature(25)	Class(5)	-0.6321	0.1501	-4.2117	2.5e-5							
CHOICE	←	attFeature(26)	Class(5)	1.7519	0.1596	10.9734	5.1e-28							
CHOICE	←	attFeature(27)	Class(5)	0.3519	0.1681	2.0937	0.036							
CHOICE	←	attFeature(28)	Class(5)	1.3031	0.1604	8.1225	4.6e-16							
CHOICE	←	attFeature(29)	Class(5)	-0.9063	0.1642	-5.5210	3.4e-8							
CHOICE	←	attFeature(30)	Class(5)	0.5193	0.1657	3.1330	0.0017							
CHOICE	←	attFeature(31)	Class(5)	-1.5820	0.1569	-10.0836	6.5e-24							
CHOICE	←	attFeature(32)	Class(5)	-0.0917	0.1514	-0.6057	0.54							
CHOICE	←	attFeature(33)	Class(5)	0.1674	0.1844	0.9078	0.36							
CHOICE	←	attFeature(34)	Class(5)	-1.9072	0.1651	-11.5544	7.0e-31							
CHOICE	←	attFeature(35)	Class(5)	-2.1997	0.1586	-13.8688	9.8e-44							
CHOICE	←	attFeature(36)	Class(5)	1.6206	0.1575	10.2910	7.7e-25							

Scale Parameters

term				coef	s.e.	z-value	p-value	Wald(0)	df	p-value	Wald(=)	df	p-value
RATING	«	1	sClass(1)	0.2803	0.0261	10.7204	8.2e-27	319.0672	2	5.2e-70	257.0354	1	7.6e-58
RATING	«	1	sClass(2)	-0.2084	0.0363	-5.7438	9.3e-9						
CHOICE	«	1	sClass(1)	0.0000	.	.	.	39.7819	1	2.8e-10			
CHOICE	«	1	sClass(2)	-0.3129	0.0496	-6.3073	2.8e-10						

Variances

term			coef	s.e.	z-value	p-value	Wald(0)	df	p-value	Wald(=)	df	p-value
u	(chol)		1.0000	.	.	.						

Variances / Covariances continuous latent

term	coef	s.e.	z-value	p-value
u	1.0000	.	.	.

The scale factor for sCLass(2)=-0.3129 and the scale factors differ significantly (p=2.8E-10).

Question C1.2: As mentioned above, respondents in sClass(2) are less consistent in their choice responses than those in sClass(1). For the Rating model, the log-scale effects are effect coded. Are these respondents less extreme in their ratings? That is, do they have a significantly lower ratings scale factor than those in sClass(2)?

Since the log-scale factors for the Response model are effect coded, the corresponding dummy coded effect would be twice that of the effect coded estimate: 2*scale = 2* (-.2084) = -.417 which is more negative than the corresponding dummy coded log-scale factor for the choice model = -.313. Hence, it appears that sClass 2 responders may be less extreme in their ratings than expected from their scale factor obtained from their choice responses. That is, -.417 < -.313.

Question C2.1: By eliminating sClass(2), Model 'sClass=1' has 3 fewer parameters than Model 'Full': these are associated with the 2 distinct scale factors in the Choice and Ratings submodel plus the relative size of the second scale class. Does this model fit better than Model 'Full' according to the BIC?

No, since the BIC value for the 'sclass=1' model is 47659 and for the 'full' model it is 47412.

Question C2.2: Is the result from question C2.1 consistent with your answer from question C1.2?

The parameter estimates for sClass(1) and sCLass(2) are respectively 0.2803 and -0.2084 so again the latter is the less consistent group. This difference is significant (p=5.2E-70).

Yes, in both questions the respondents in the second sclass are less consistent.