

Solutions to the Exercises (**SensMixed + ConsumerCheck**)

Look at the data set and describe it shortly, e.g. how many attributes, how many products, assessors and how many repetitions?

In the data 8 Assessors scored 15 attributes in 2 replicates 12 products (3 by 4 combinations of TVset and Picture). There are no missing values, the data is balanced.

6. Perform similar analysis but considering maximal possible model (including replicate and multi-way product structure if possible)

- What modelling controls / analysis controls have you chosen? Why?

The choices in

Select products: TVset, Picture (multi-way product structure)

Select Replecates: Repeat

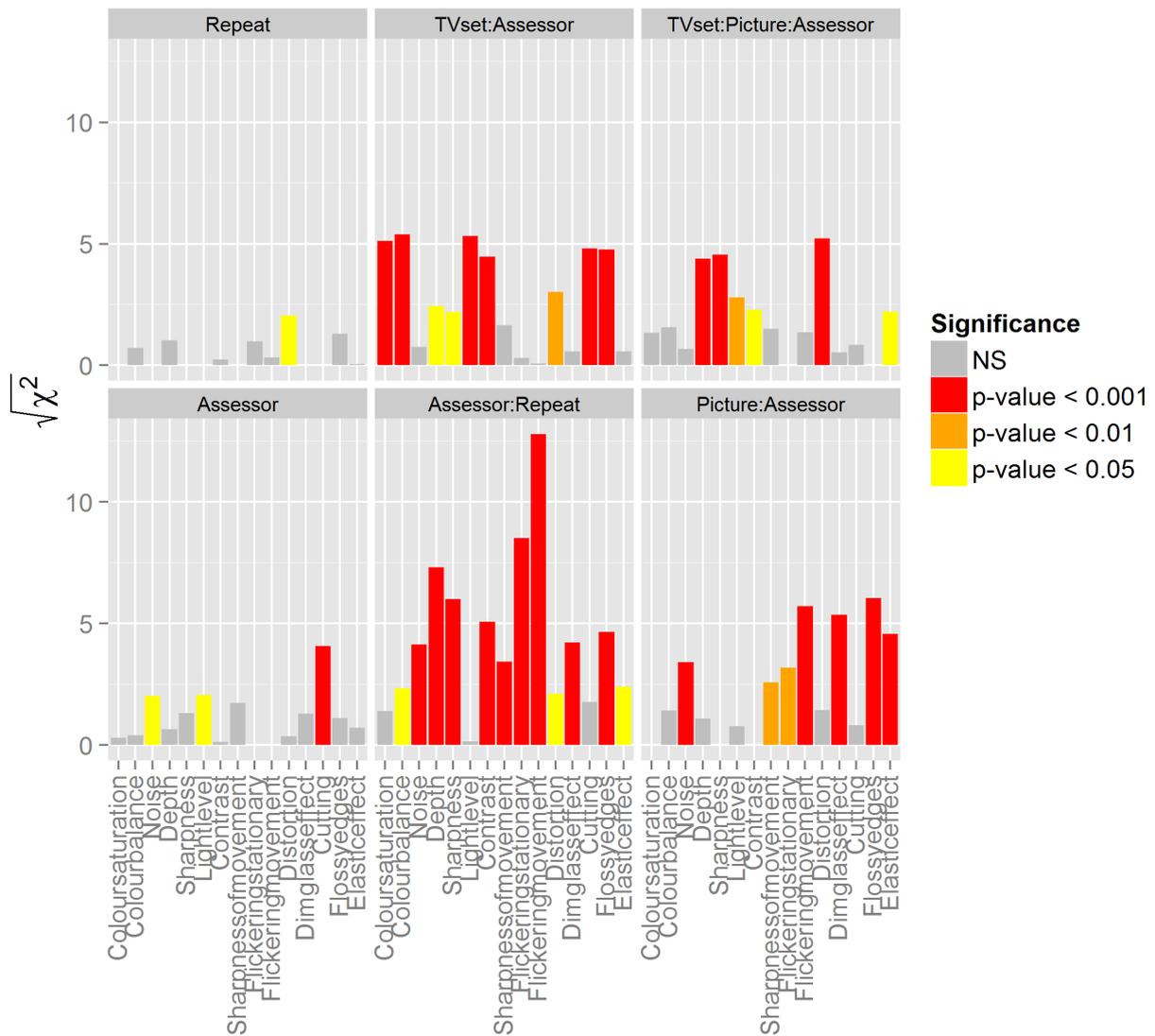
Modelling controls:

product structure = 3 (main effects TVset Picture and interaction TVset:Picture)

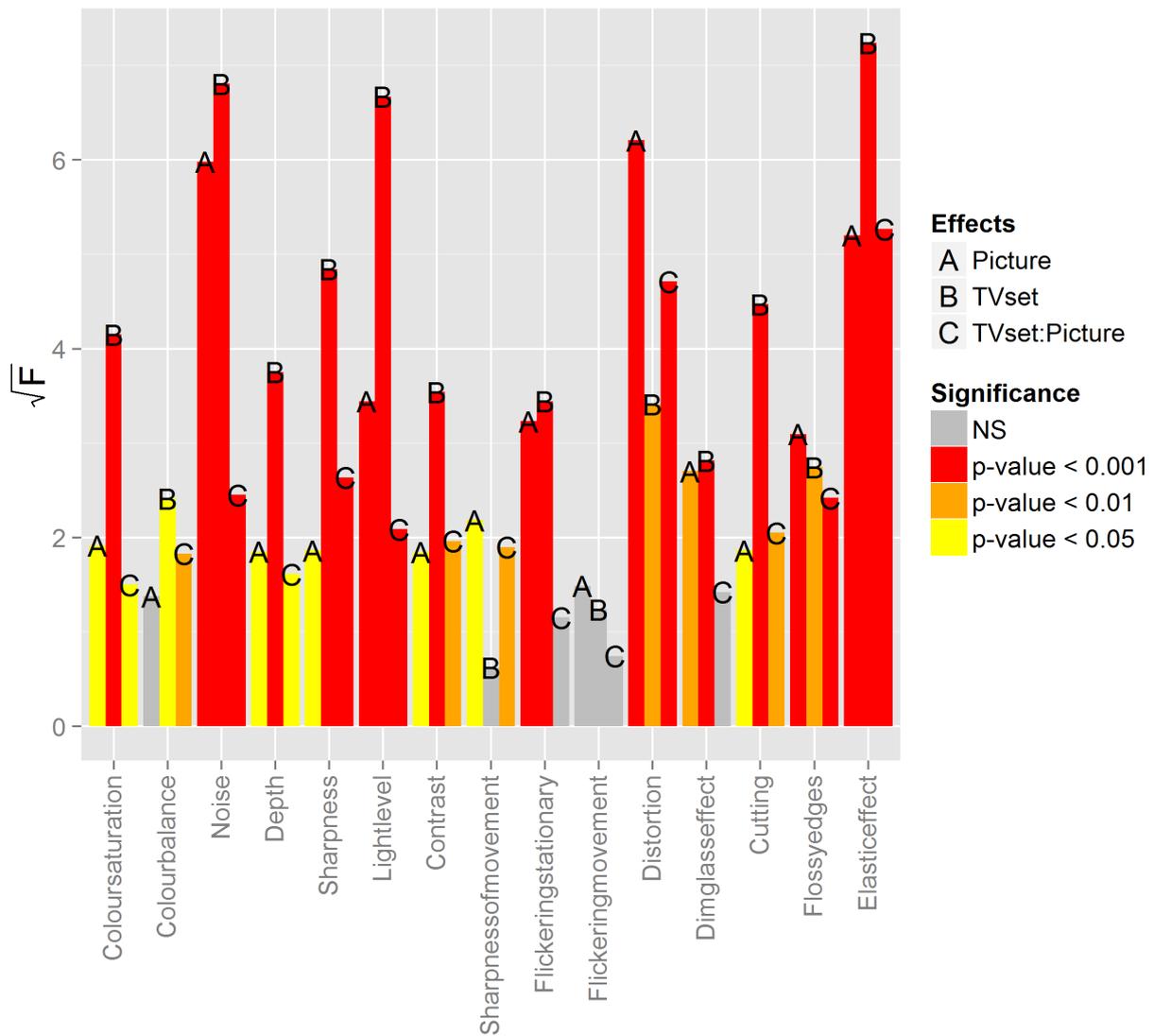
Error structure = 2-WAY: maximal possible error structure but without Repeat:Product interaction (since from the tutorial example it was clear that this effect was NS)

In analysis controls I choose Simplify error structure = Yes, since the effects that do not contribute to the systematic variation in the data may be excluded, by this the SensMixed finds the parsimonious model with the reduced error structure.

- Look at the multi-attribute plot/table output. What can be observed which was not seen when considering only one product effect? Make a small report (in e.g. a .doc file), where you put the results from the application (by using the Download button)



The multi-attribute plot for the random effects gives more insight on the discrimination between the products among assessors. For example, for Elastic effect, Assessors disagree in scoring the products, but mainly due to the Picture feature.



The same for the fixed effects, the multi-way product structure gives more insight into the data. For instance, for Colourbalance attribute, products are different mainly due to the TVset feature

- Choose one of the attributes and look at the results of the analysis for this attribute in the Step output and Post-hoc output.

I selected Lightlevel attribute

Likelihood ratio tests for the random-effects and their order of elimination representing Step 1 of the automated analysis for the attribute Lightlevel

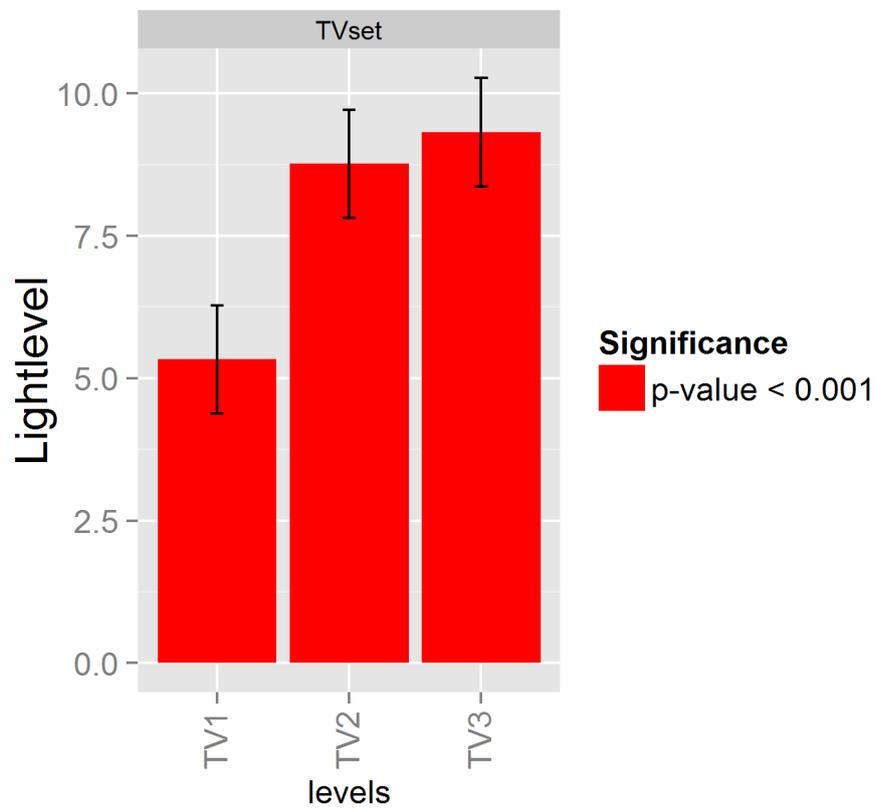
	Chi.sq	Chi.DF	elim.num	p-value
Repeat	0.00	1	1	1.000
Assessor:Repeat	0.03	1	2	0.874
Picture:Assessor	0.60	1	3	0.438
TVset:Assessor	28.39	1	kept	<0.001
TVset:Picture:Assessor	7.76	1	kept	0.005
Assessor	4.27	1	kept	0.039

F-tests for the fixed-effects for the attribute Lightlevel

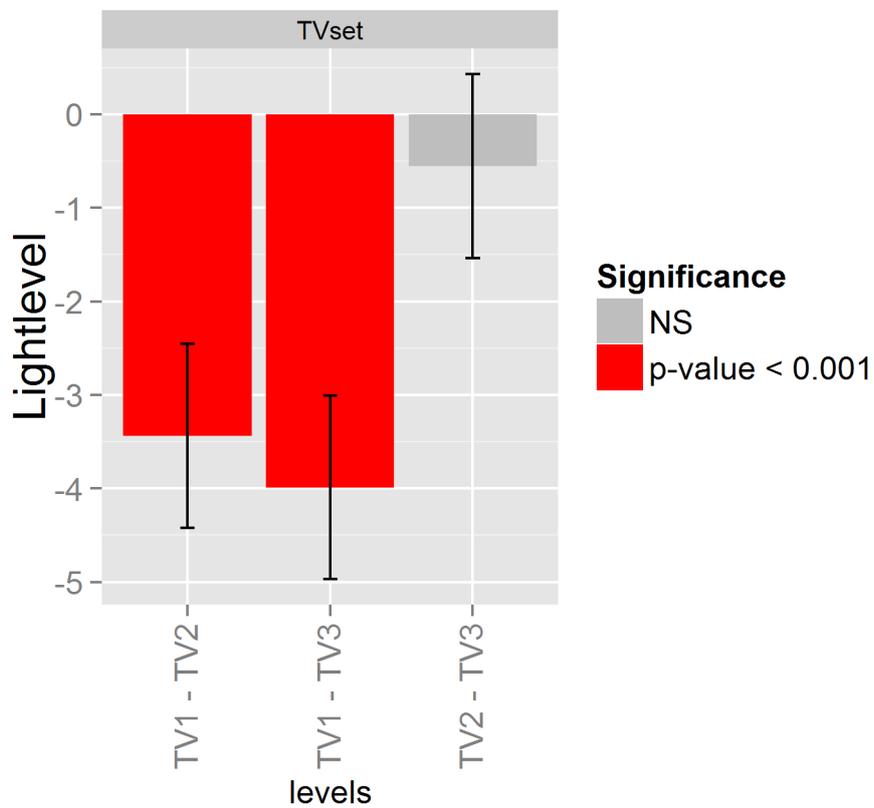
	Sum Sq	Mean Sq	NumDF	DenDF	F-value	d-prime	Pr(>F)
TVset	47.14	23.57	2	14.00	44.50	4.20	<0.001
Picture	18.84	6.28	3	63.00	11.86	0.96	<0.001
TVset:Picture	13.87	2.31	6	63.00	4.37	0.75	<0.001

First the ANOVA-like table for testing random effects is presented. It can be seen that the initial model contained 6 random effects. Three of them were eliminated as claimed to be non-significant according to the default Type 1 error rate equal to 0.1. The effects were eliminated in the following order: Repeat, Assessor:Repeat, Picture:Assessor. The effects corresponding to elim.num = kept were used in testing the fixed effects TVset, Picture and TVset:Picture from the second table. From the Fixed effects table it can be observed that all main effects and interaction effect are highly significant.

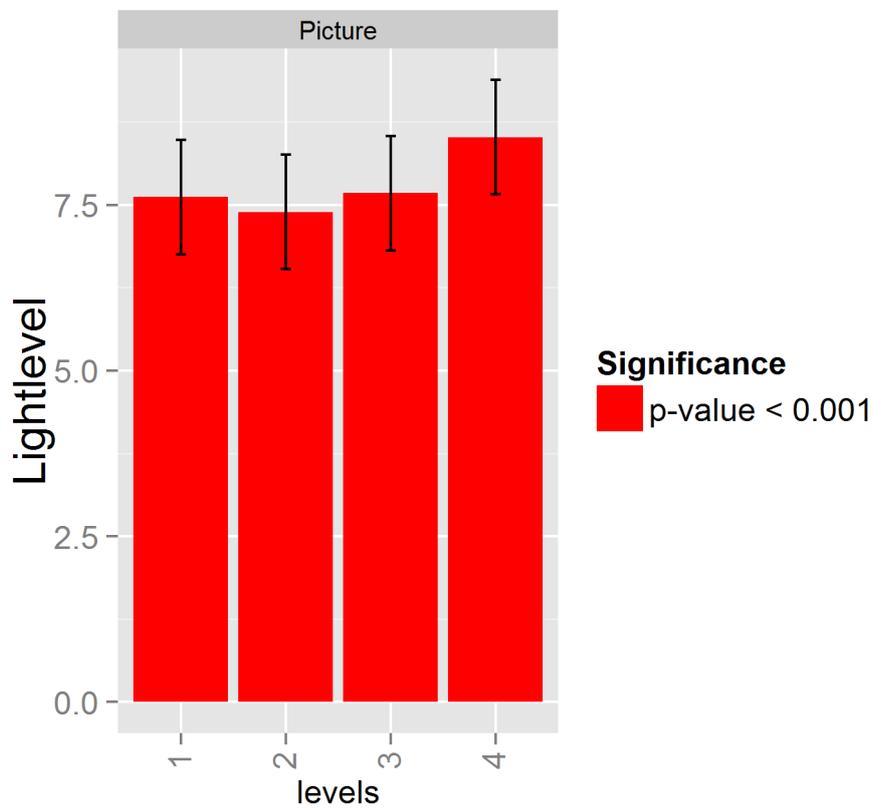
Post-hoc for Lightlevel:



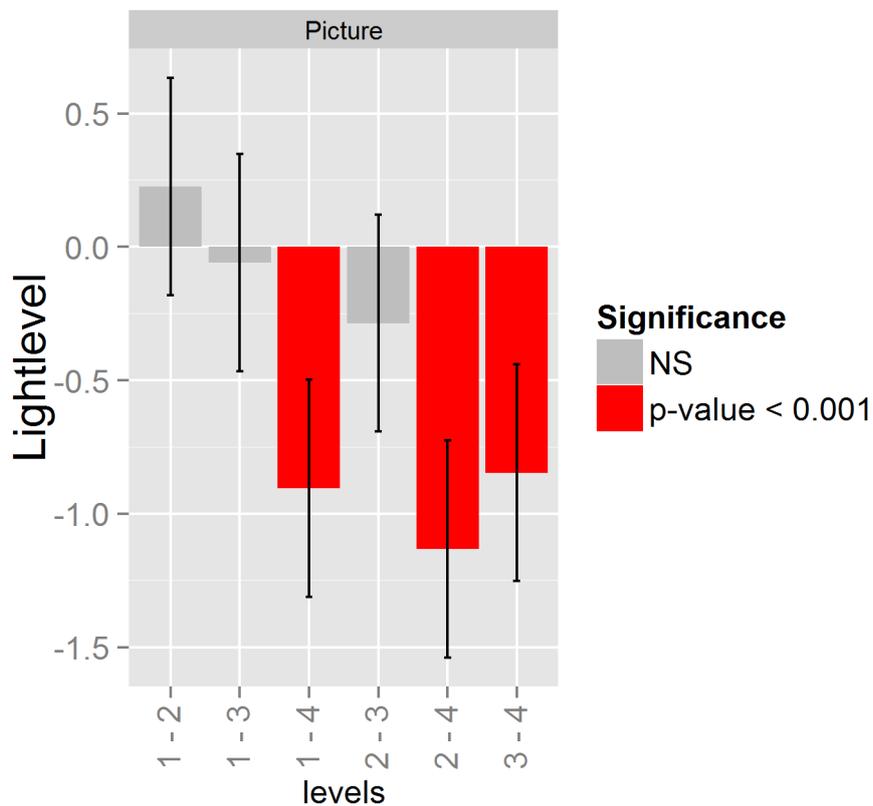
First I look at the LSMEANS for TVset levels (TV1 TV2 TV3)(for this data this corresponds to the actual average values of Lightlevel attribute for the three levels of TVset). From the plot it can be observed that Lightlevel for TV1 is much lower than for the other two.



The DIFF of LSMEANS plot confirms our observation that product with TV1 is significantly different from the products with TV2 and TV3. DIFF of LSMEANS visualizes difference of LSMEANS values plus confidence intervals.



For the Picture feature LSMEANS plot shows that products with Picture 4 have higher scores for the Lightlevel attribute than Picture 1,2 and 3. Pictures 1,2 and 3 seem to have not that different scores.



The DIFF of LSMEANS plot confirms the observation, mainly that products with Picture 4 are significantly different from the products with Picture 1,2,3.

Exercises for ConsumerCheck

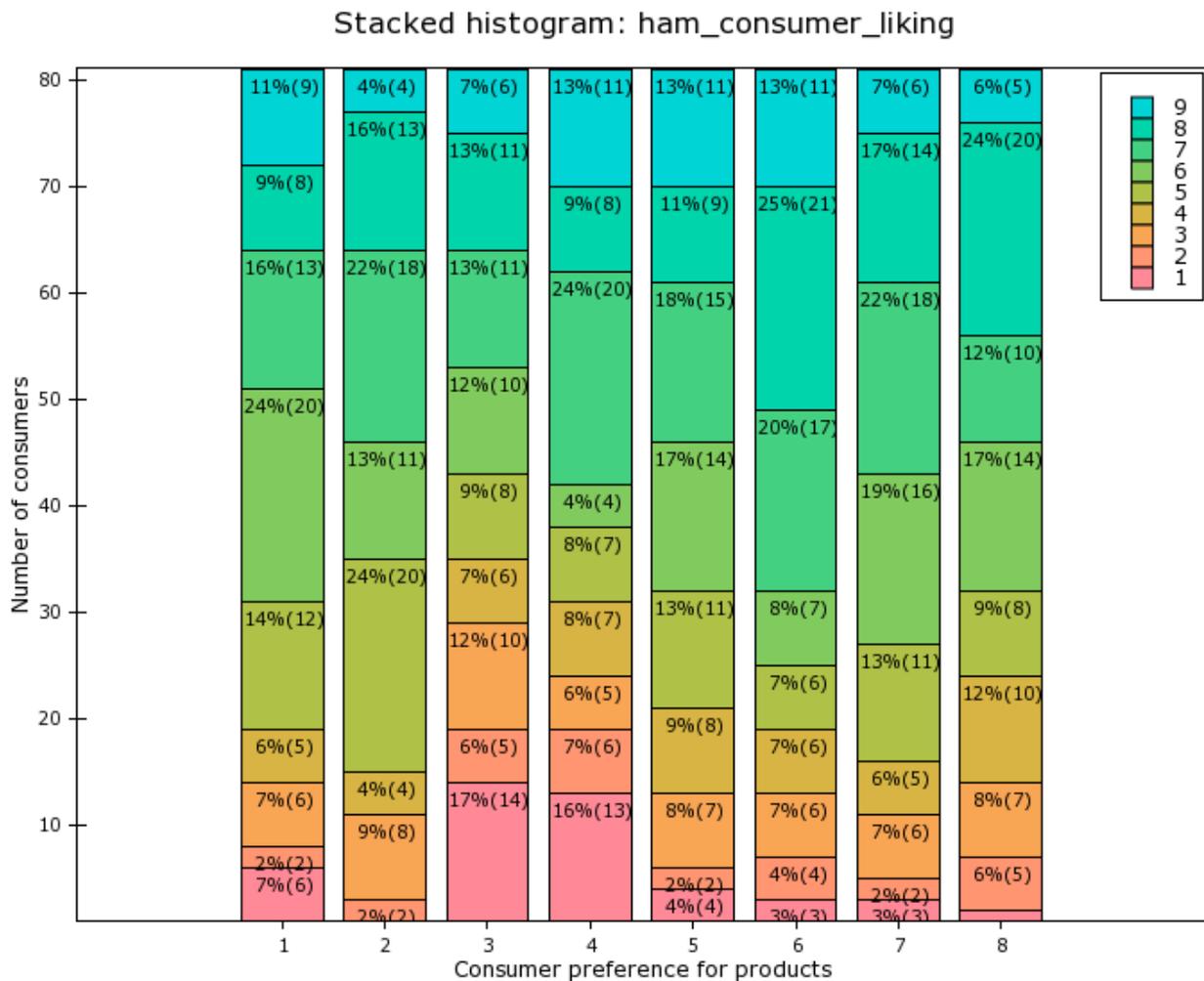
1. Download and install the latest version of ConsumerCheck software from <http://consumercheck.co/>
2. Overview Sections 3.6 and 6.7 of ConsumerCheck paper (JSS_CCpaper_FIX.pdf)

In the following Use your own data OR use the version of the ham data set (contained in the ConsumerCheck).

3. Make a short description of the data.

The data is balanced. There are two background variables: Sex and Age. Age is quantitative

4. Make some exploratory analysis of the data by using the Basic stat liking tab



Product 6 has large amount of scores in the upper scale (as well as product 8).
 Products 3 and 4 have quite some scores in the lowest part of the scale.

5. Try different structures for the conjoint

a. Are the liking scores different for different genders? Are the liking scores different for different products? Are there any significant interactions?

b. Look at the pairwise comparisons tests. Which products are significantly different between each other?

By choosing structure 3 maximal possible model is constructed and reduced to the parsimonious one.

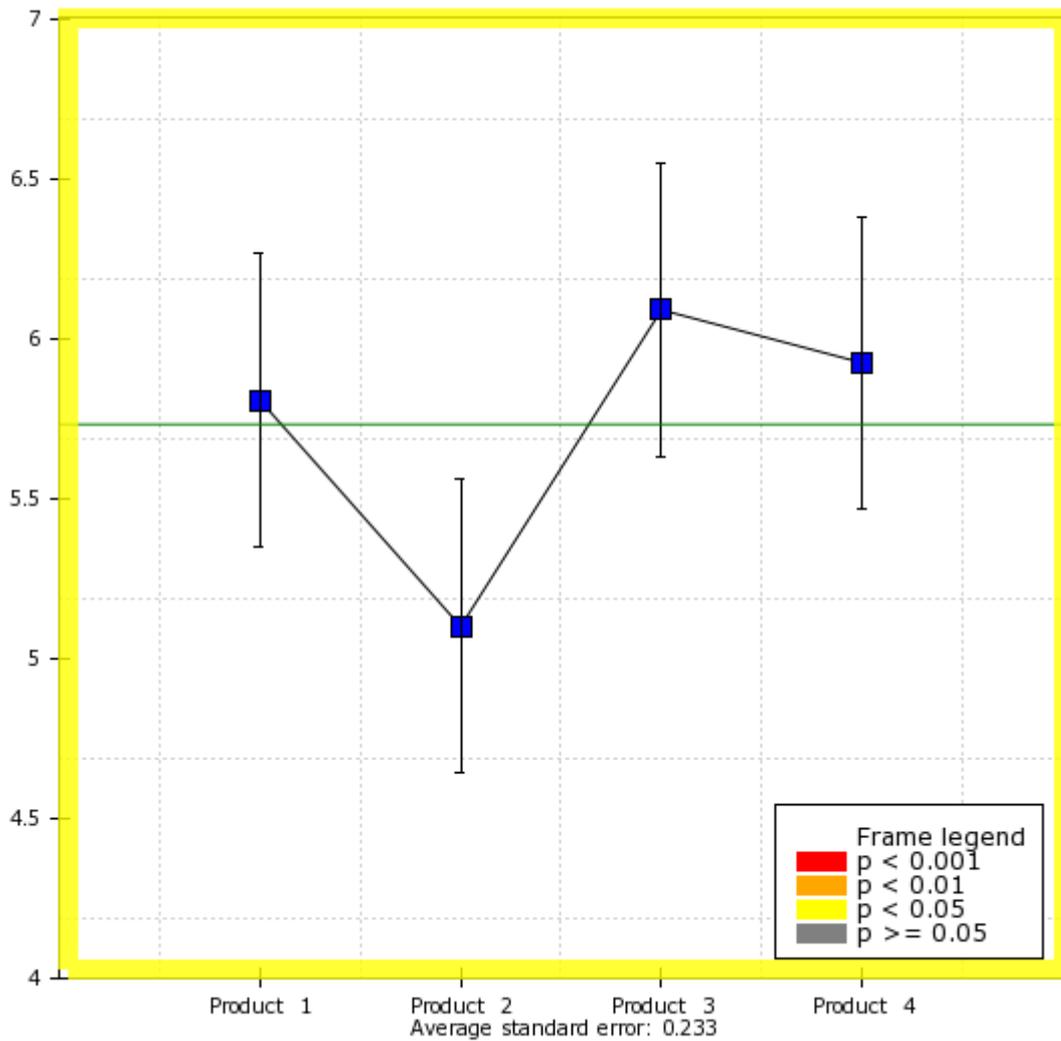
ANOVA table for random effects				
Names	Chi.sq	Chi.DF	elim.num	p.value
Information:Consumer	1.56	1	1	0.212
Product:Consumer	168.42	1	kept	<0.001
Consumer	3.09	1	kept	0.079

ANOVA table for fixed effects							
Names	Sum Sq	Mean Sq	NumDF	DenDF	F.value	elim.num	Pr(>F)
Information:Product:Sex	5.99	2.00	3	315.98	1.20	1	0.310
Product:Sex	1.74	0.58	3	236.98	0.35	2	0.790
Information:Sex	1.41	1.41	1	318.98	0.84	3	0.359
Sex	1.47	1.47	1	78.98	0.88	4	0.351
Information:Product	10.39	3.46	3	319.97	2.08	5	0.103
Information	6.52	6.52	1	322.97	3.87	kept	0.050
Product	19.35	6.45	3	239.98	3.83	kept	0.010

The output tables show that Consumers disagree in scoring the products. There seem to be no significant interactions. The likings scores between genders are not significantly different.

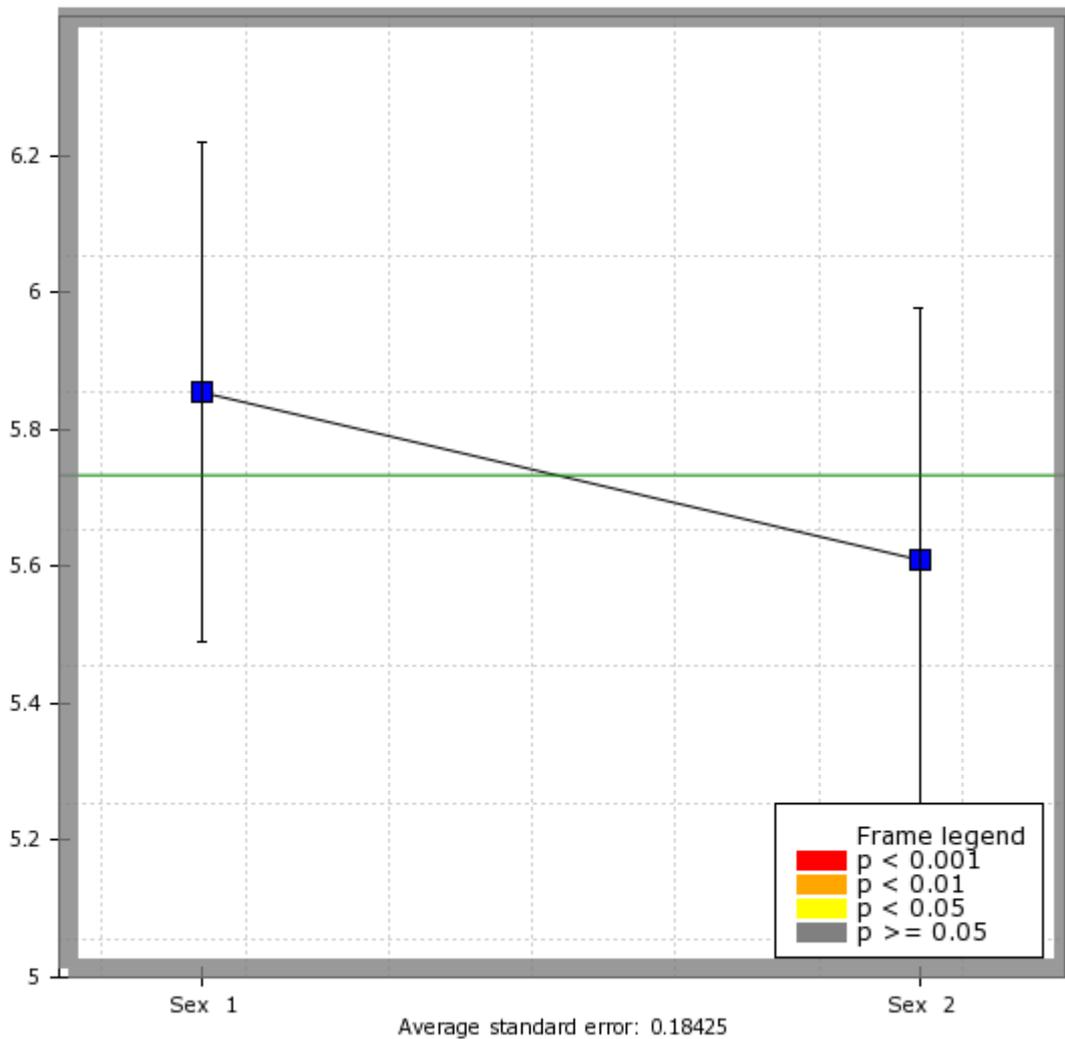
Then I choose Struct= 2 and rerun the analysis in order to get 2-way interaction and main effects plots for all possible effects.

Main effect: Product



The main effects plot for product effect visualizes least square means for the product effect together with the confidence intervals. It can be seen that Product 2 seems to be the less liked and Product 3 the most liked.

Main effect: Sex



Sex 1 seem to generally like products more than Sex2, but the analysis claims that the difference is not significant.

	Estimate	Standard Error	DF	t-value	Lower CI	Upper CI	p-value	p-value.adjust
Product 1-2	0.7072	0.3154	237	2.24	0.0858	13.286	0.0259	0.1554
Product 1-3	-0.2825	0.3154	237	-0.9	-0.9039	0.3389	0.3714	1
Product 1-4	-0.1172	0.3154	237	-0.37	-0.7386	0.5042	0.7105	1
Product 2-3	-0.9896	0.3154	237	-3.14	-1.611	-0.3682	0.0019	0.0114
Product 2-4	-0.8244	0.3154	237	-2.61	-14.458	-0.203	0.0095	0.057
Product 3-4	0.1652	0.3154	237	0.52	-0.4561	0.7866	0.6009	1

The table of pairwise comparisons tests show that Product 2 is significantly different from Product 3 and 4 (which is also noticeable from the main product effect plot).