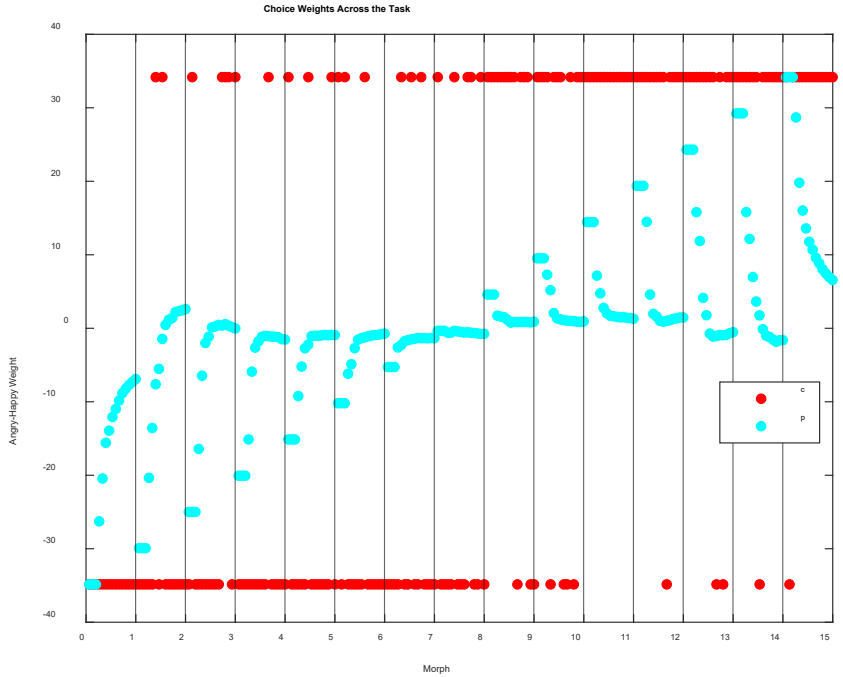
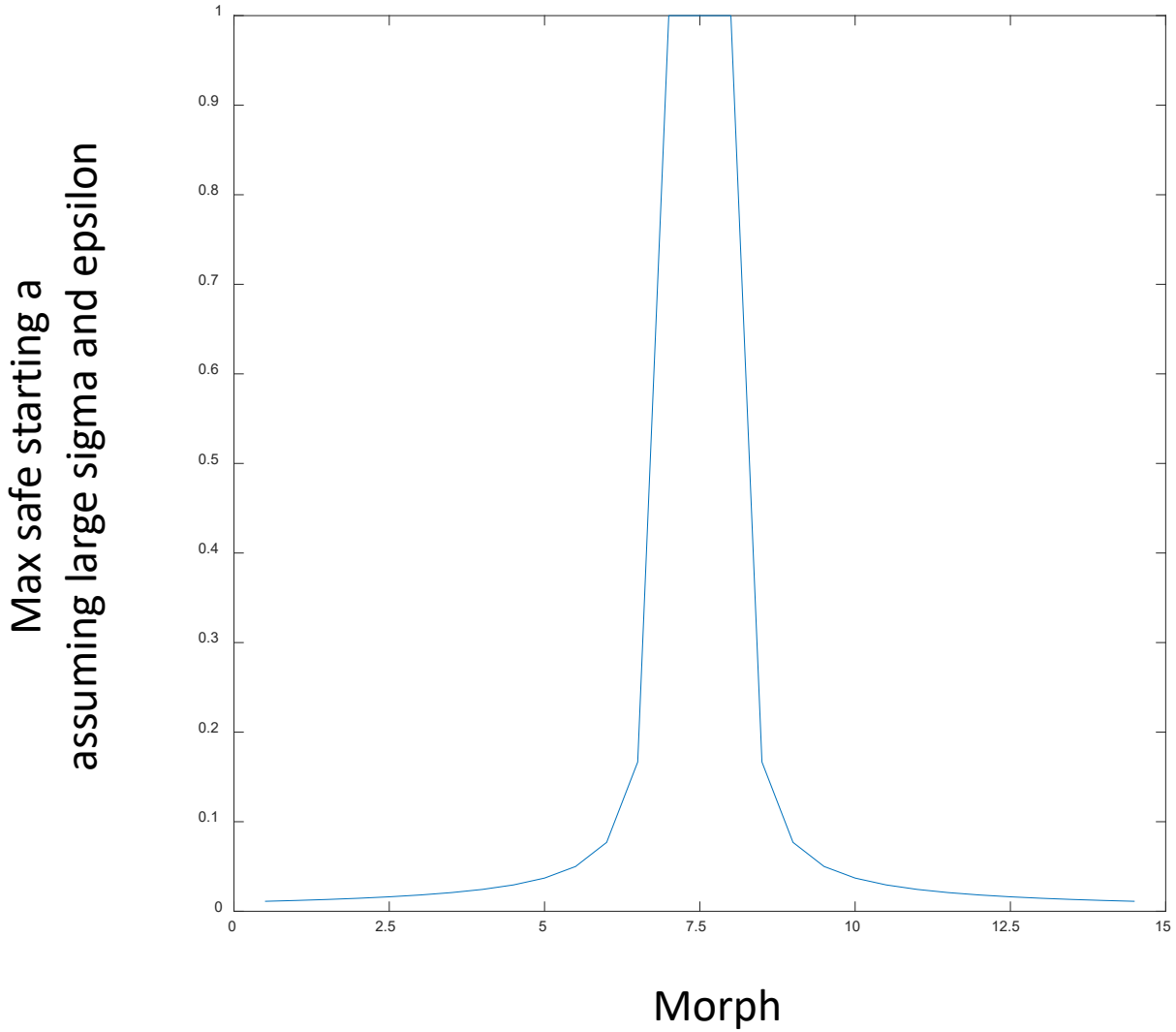
Summary: I think we limit s to a max of 1

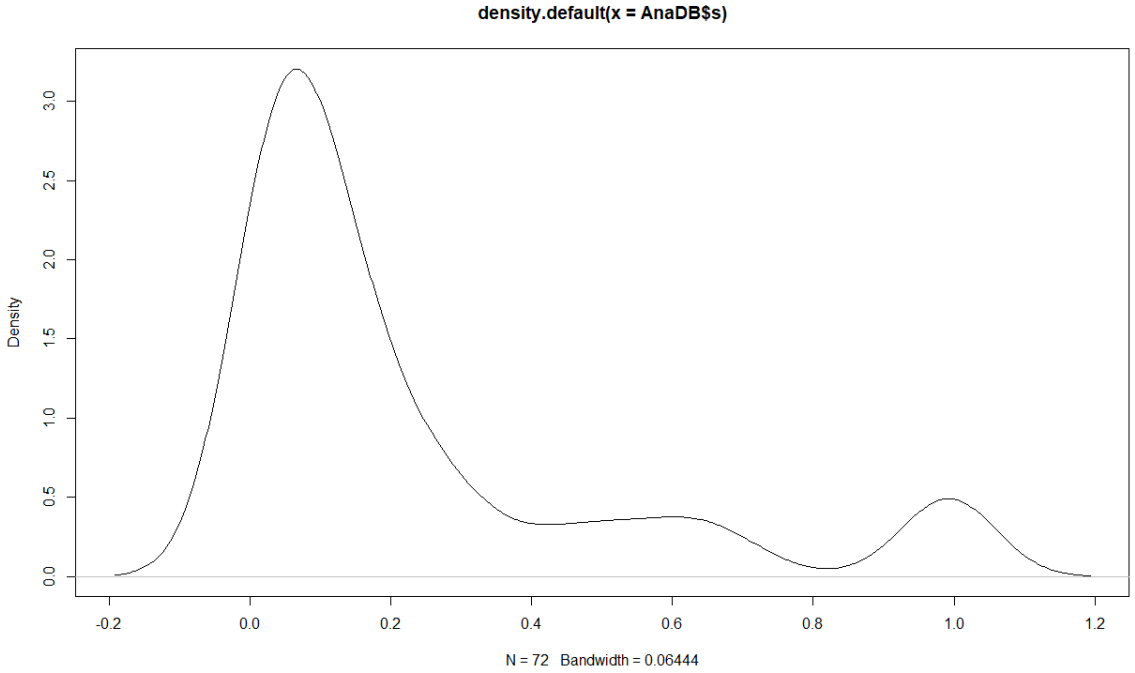
- Most empirical values of s are < 1 with any bound.
- By limiting starting values of s, but not the values of s, (slide 2), we prevent false starts due to updates to the weight matrix exceeding maximum values, causing catastrophic increases in weights. The equation for limiting the start of s is encoded in the mod1.m file.
- When s is allowed to go to 10, differences in estimates almost always occur when s is estimated to be greater than 1 (slide 5).
- Empirically
  - Sum of max LL on 72 subjects differs by 0.1%, weak evidence for allowing s to range to 10.
  - Against an external standard, the association between predicted indifference points by the model or 4-parameters logistic curves favors bounding s by 1.
- Qualitatively
  1. Bad source data to fit (lots of errors).
  2. Model misspecification (the participant grows tired can begins to answer more randomly towards the end of the task). (See right).
  3. A large bound on s means that W may be large. It causes graphs that look like model misspecification, e.g. that a person grows tired and responds more randomly. Though inspection of the raw data don't appear this way).
  4. When there is no clear difference between parameters and fits, lower s values are related to higher theta values. It may be the reverse that high determinism may be estimated as a high value.
- Bounding s by 1 buffers erratic estimates from 1-4 above. Empirically, their values are less further away from a standard. (Slide 5).

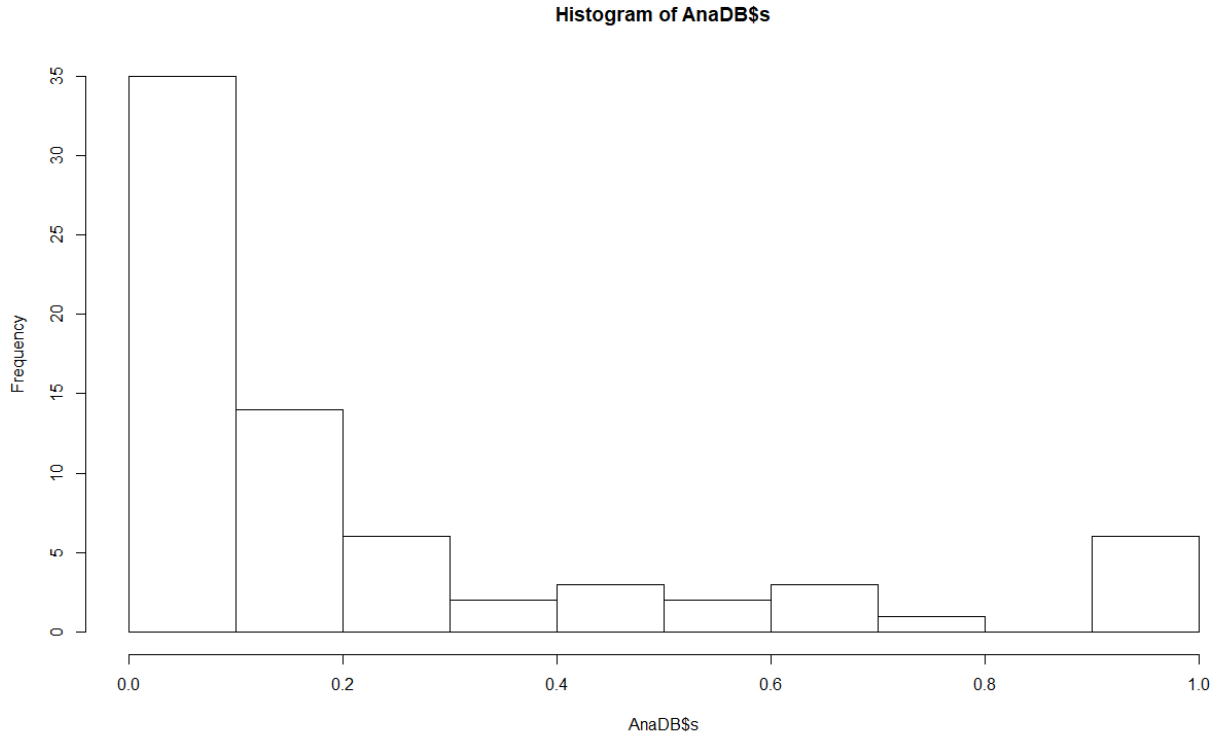


Model misspecification. This person started responding randomly in the task. We know this because of pre-post testing and administration notes increasingly poor attention. The model does not have a mechanism for such fatigue.


Max safe starting a
assuming large sigma and epsilon
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2.5
5
7.5
10
12.5
15
Morph

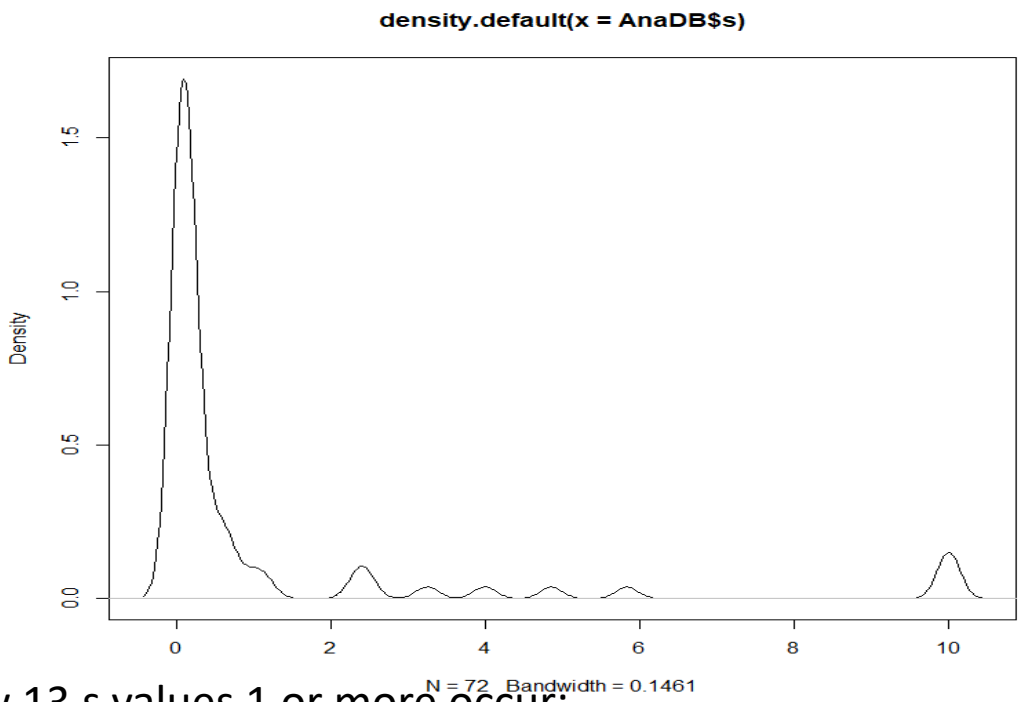
Density plot of empirical s
fmincon fits to 72 people, s bounded 0-1

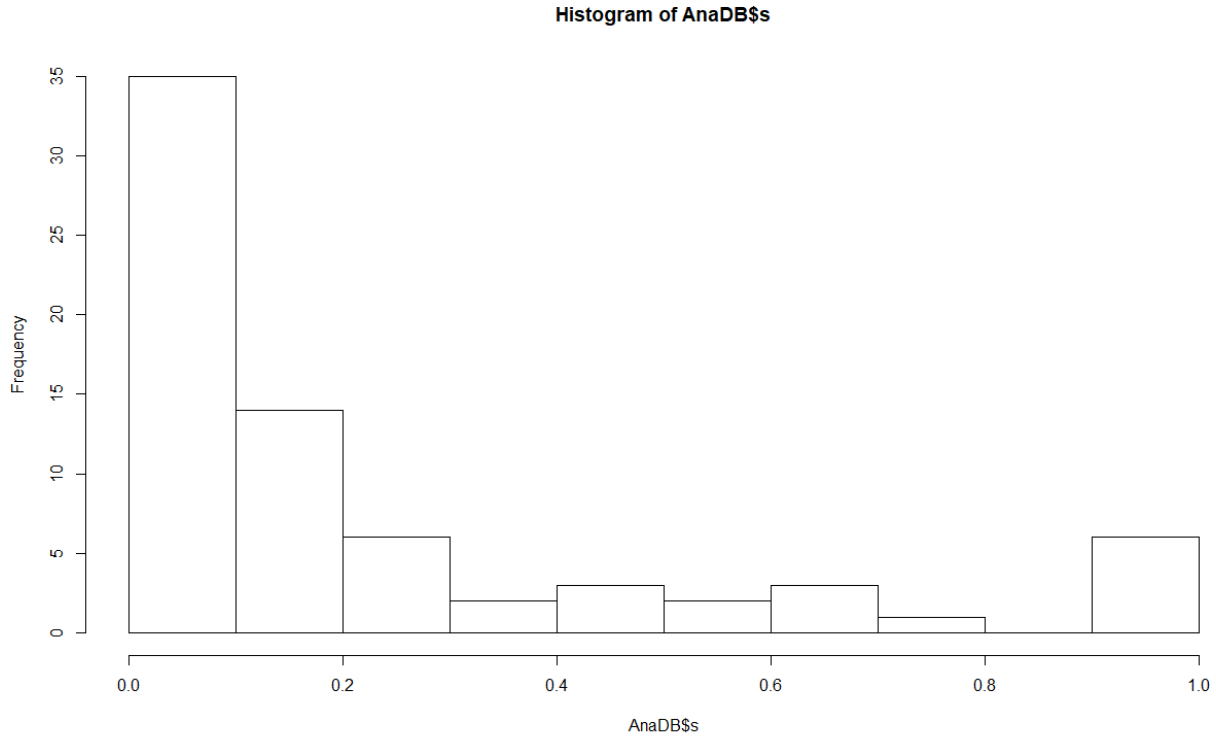




As predicted, the 4 s values near 1 only occur with epsilon near zero (n=3) or sigma near zero (n=1). This suggests a multivariate relationship between the 3 as described in the email.
Sum maximum likelihood = 5538.444.

Density plot of empirical s
fmincon fits to 72 people, s bounded 0-10





Now 13 s values 1 or more occur:

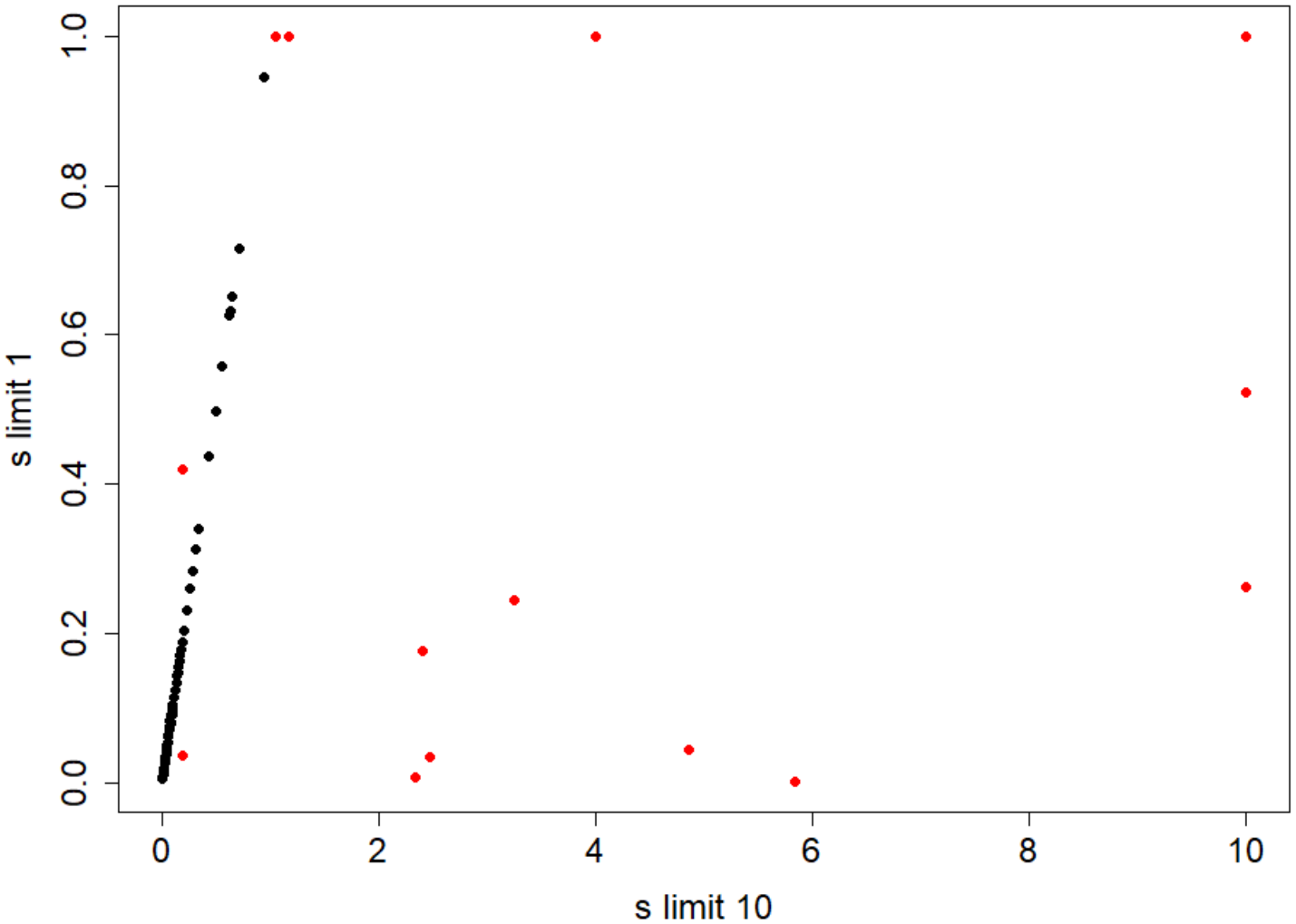
epsilon < .01 (n=3)

sigma < 0.5 (n=4)

7.5<=p<=8.5 (n=7)

None of above but combination small epsilon & sigma (n=1)

Sum maximum likelihood = 5529.198, more failures of fmincon.



What about 15 individuals with different s estimates?

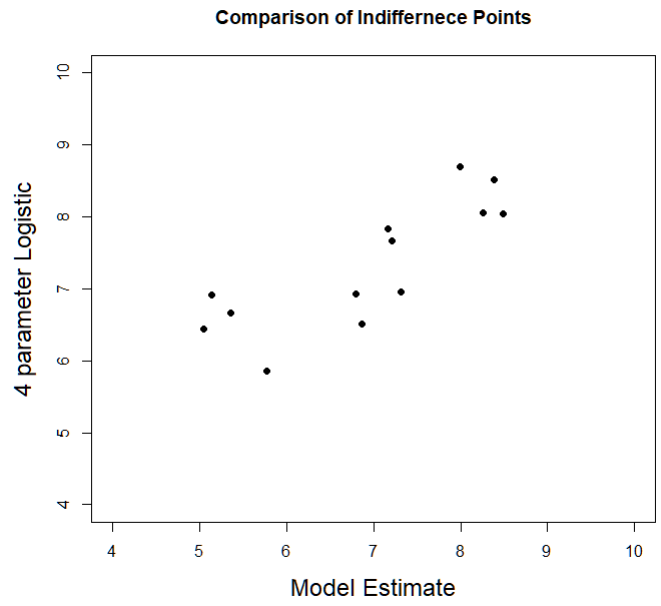
Note, the 4 individuals in slide 2 who were at max are simply limited by the bound.

Differences where s<1 in both version are small.

Visual inspection of all values and QC graphs lead to a summary in slide 6. Notes are in a separate excel file, Parameter Differences with S Bounds.

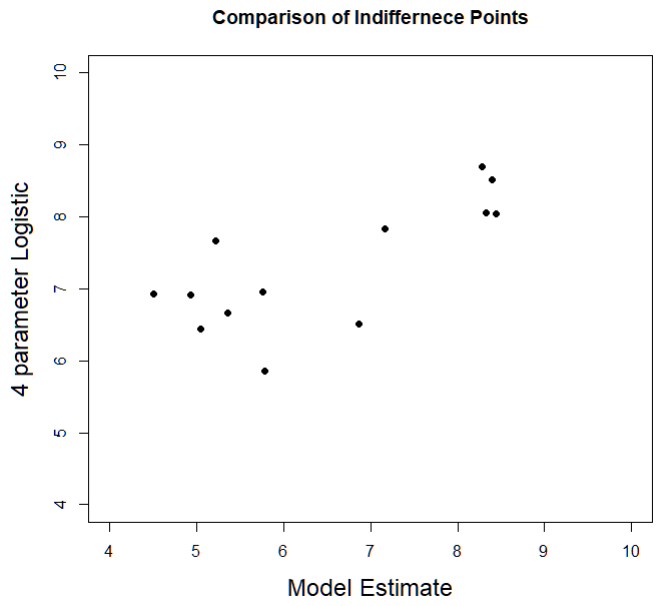
External Validation: Comparison indifference points by model versus a 4-parameter logistic fit to raw data.

s <= 1



r=0.82

s <= 10



r=0.74