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Computational neuroscience
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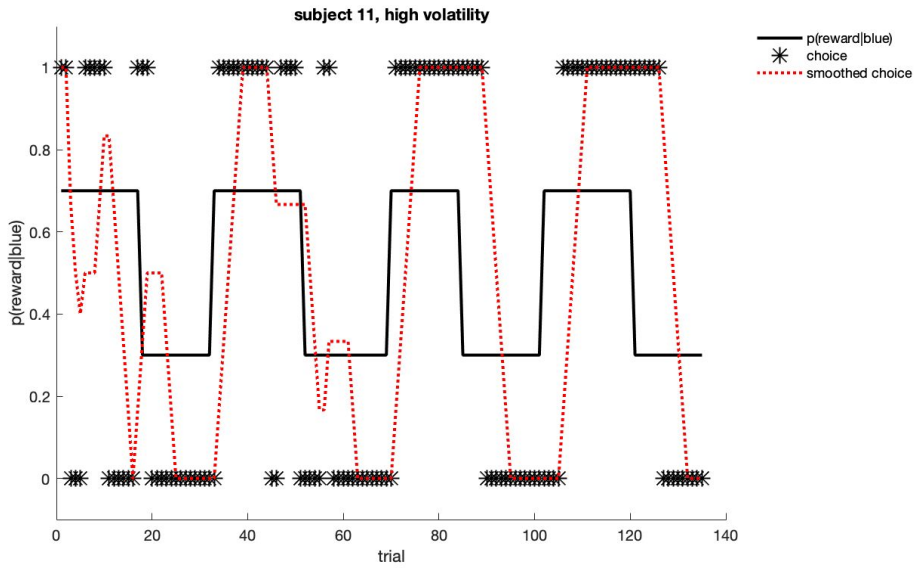
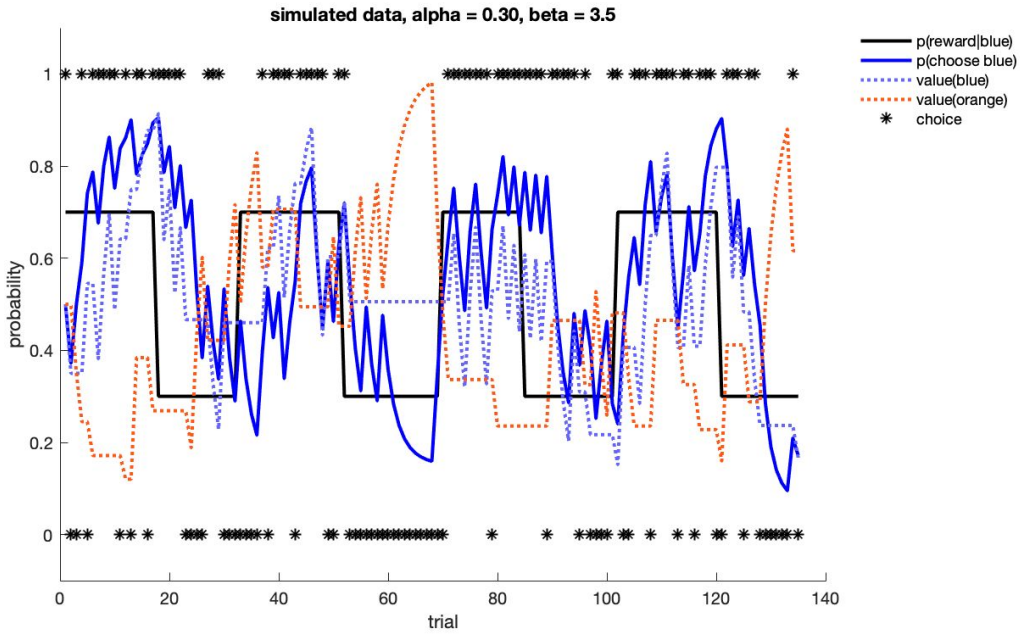
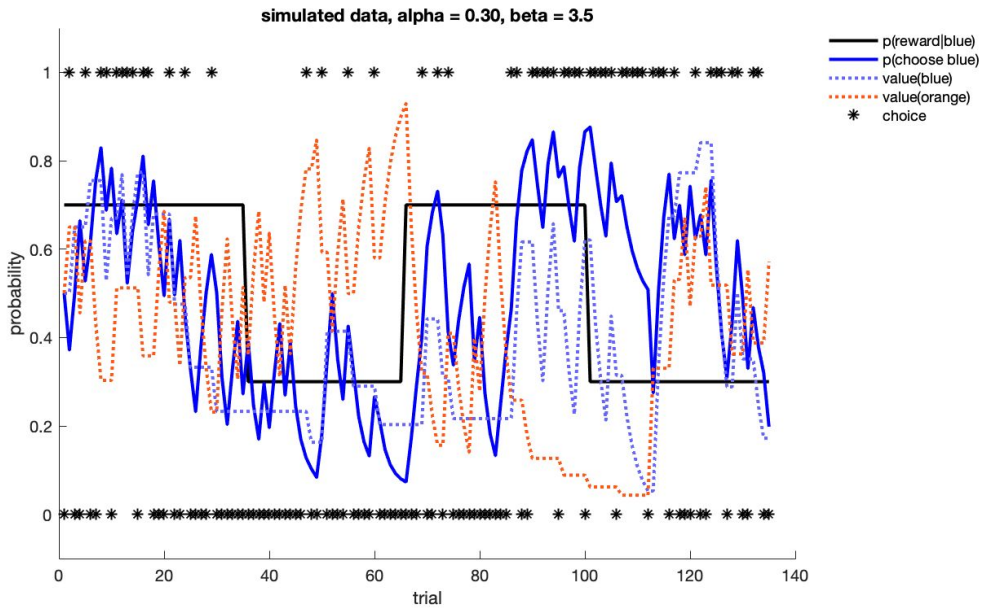
Homework 8

1. **Data from subject 11**

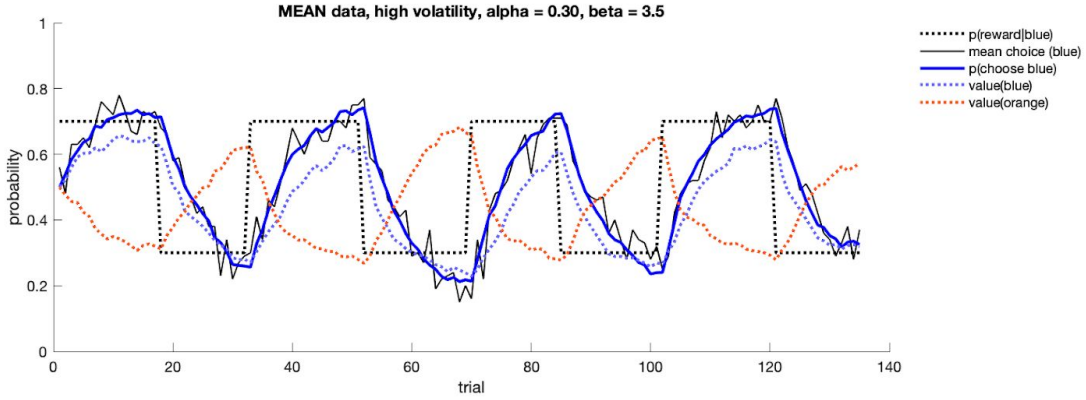


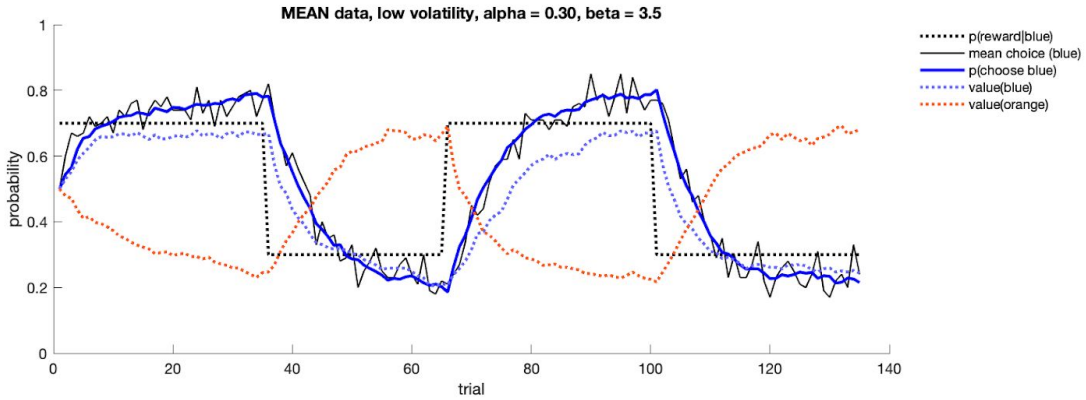
2. Simulation for alpha = 0.3, beta = 3.5



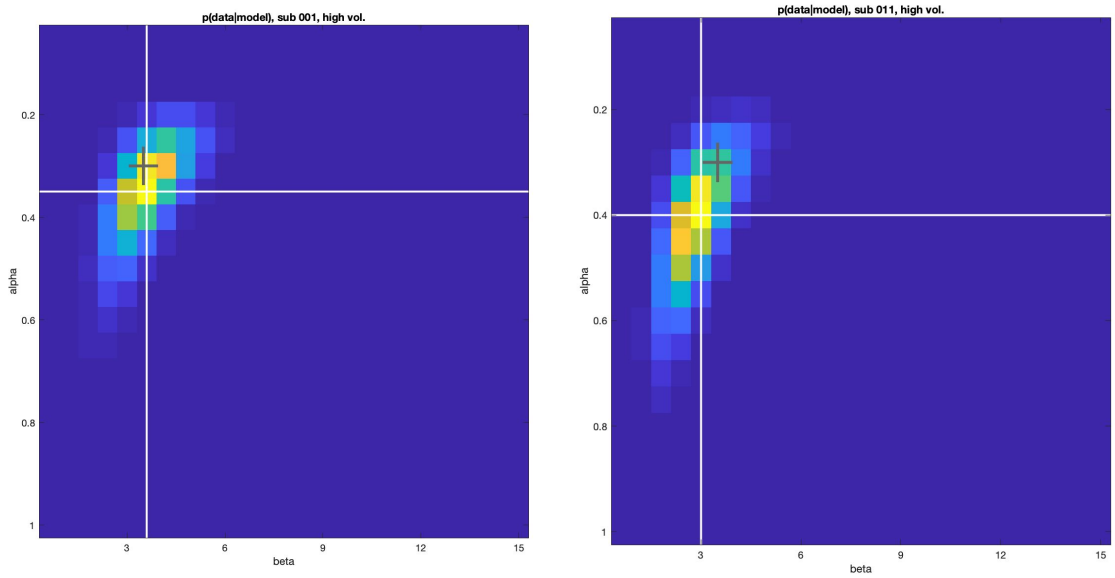


3. Lots of participants



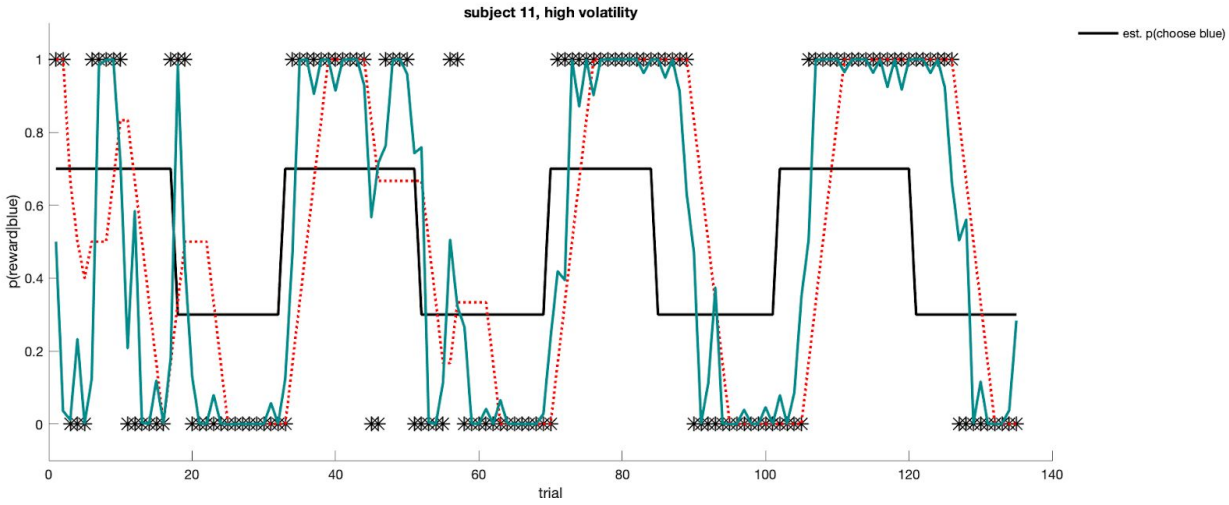


4. **Recreate the figure.** I am uncertain if you want us to utilize subject 1's data or the subject assigned to us. Therefore, I include both of them.



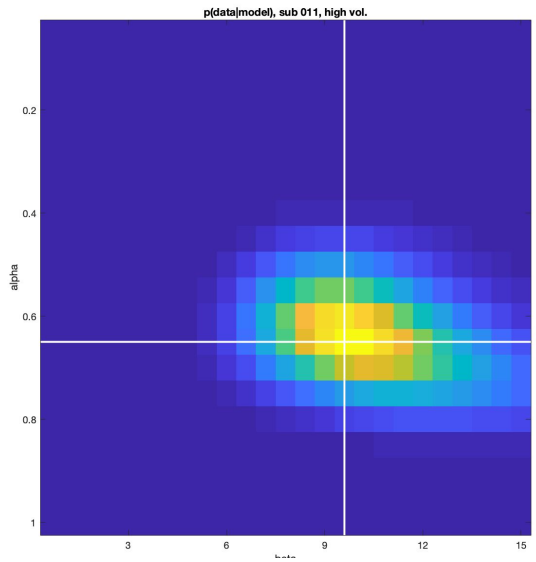
5. **Fitting the data(subject 11)**

a. Trial-wise plot



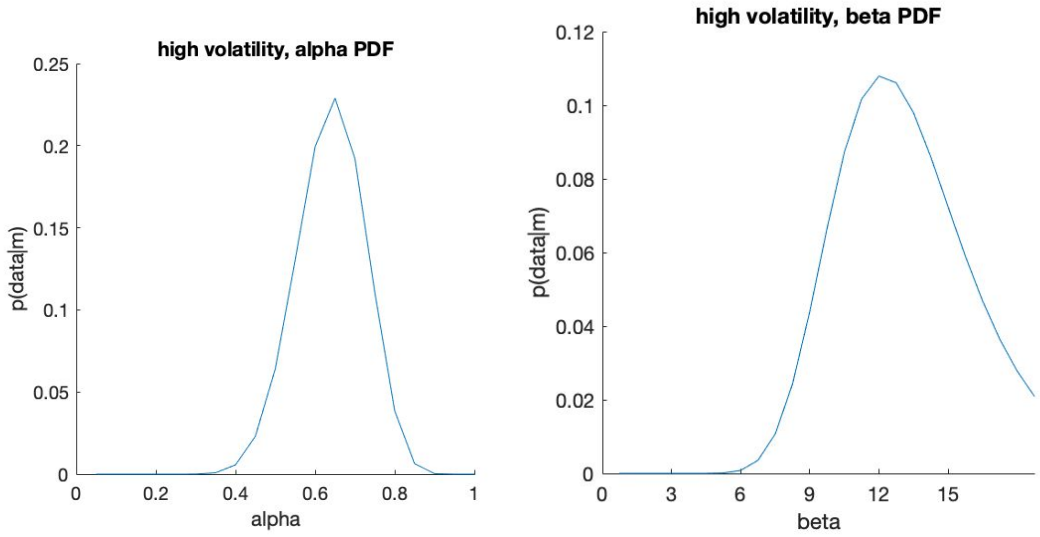
Does the estimated choice probability follow your choices reasonably well? I think the estimated choice probability follows subject 11's choices reasonably well. At the beginning trials(first 20), there are some variations between the estimated possibility and the subject's data. Maybe he/she try to explore different machines randomly. But then in the later trials, the curve fit pretty well with the real data.

b. Likelihood surface plot



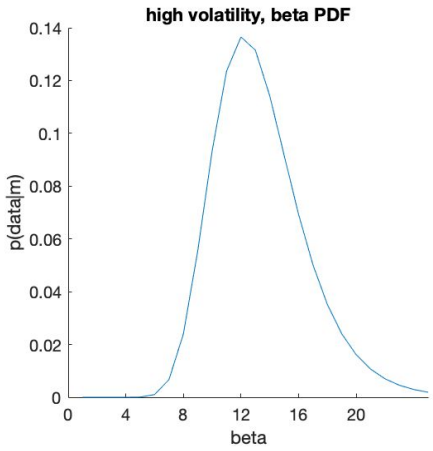
I would argue that the surface plot is relatively peaked. But there are different combinations of parameters that potentially lead to the same likelihood. And the likelihood values for different values of α and β do not vary independently.

c. Marginal parameter distributions



Are the distributions relatively normal, or very skewed? Are they peaked (ie do you have high confidence in a single value) or very broad. Are the distributions cut off at the bounds?

The distributions are relatively normal. I think the distributions are relatively peaked. The beta PDF distribution was cut off at the bounds. After I enlarge the grid to cover the full parameter space, I got the following graph



6. The p-values reporting significant differences in the posterior expected values for the learning rate--**Parametric p: 0.6270; Nonparametric p: 0.7771**
   the softmax temperature--**Parametric p: 0.3629; Nonparametric p: 0.1718**
   The lower the p-value, the less likely it is that the learning rate(or the softmax temperature) between-groups is not different. If we follow the generally accepted probability that rejects the null hypothesis 0.05, then we could argue that the learning rate and the softmax temperature is the same in the high and the low volatile group($p > 0.05$). Therefore, subjects do not adapt their learning rate or softmax decision parameters based on whether they are in a volatile or stable environment.

Group Project

Still discussing.