

ST 512 - Lab 9 - Introduction to Random Effects

1. Open the `Lab9.sas` file which uses the `Beer` data set. This data set contains measurements on sodium contents in lager for beer from six randomly selected brands of beer produced in the U.S. and Canada. For each beer, eight 12-ounce samples were measured for sodium content.
2. Begin by running the code in Code Block 1 to create a graph of sodium content for each brand.
3. Examine your plot. Which is the bigger source of variance: random effect between brands or random effect due to bottles within brand? Is your answer consistent with what you would've expected?
4. Write the model that treats brand as a random effect. Be able to identify each component (including subscripts) using terms like 'sodium content', 'brand', and 'bottle'. Be sure to include the model assumptions.
5. Run the code shown in Code Block #2. What output is provided that we didn't see in our previous fixed effects models?
6. Can you estimate the variance components based on your `PROC GLM` output?
7. Code Block #3 introduces a new procedure `PROC MIXED` that is better equipped to handle random effects. Look at the `MODEL` and `RANDOM` statements used in Code Block #2 vs. #3. Why do you think the code in Code Block #3 is doing?
8. Run the code shown in Code Block #3. How does this output compare to what you saw in Code Block #2?
9. Estimate the variance components based on your `PROC MIXED` output in Code Block #3. Do they support your graph-based decision from above about which source of variation was larger?
10. Utilize the expected mean squares table to calculate an estimate for the Expected Mean Square for brand. Is that number anywhere in your output? Does this affect your answer as to whether variance components estimates can be found in the `PROC GLM` output?
11. Run the code shown in Code Block #4. How does this output compare to what you saw in Code Block #3? Do you think that will always happen?
12. What hypotheses would be tested to determine if there is any significant brand variability? Test these hypotheses using your output and provide a conclusion.