**APPLIED STATISTICS EXAM**

**DATE:** 12/07/2022

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**EXERCISE NUMBER N**

First of all we give a glance at the data distinguishing with [CATEGORY]:

[PLOT COLOURED BY CATEGORY]

It appears to be a difference, let’s build a linear model using also the interaction between frequency and velocity. We estimate from the model the coefficients and the standard deviation of the error, sigma:

beta.00 =

beta.01=

beta.10 =

beta.11 =

sigma =

CHECKING THE ASSUMPTIONS OF THE MODEL:

We check if residuals are normal through a shapiro test (pvalue =[P-VALUE]) and we conclude that they are,

the VIFs are VAR1 : VAR2 : VAR1:VAR2 : and they’re good enough to say that there’s not so much collinearity.

[PLOT OF RESIDUALS]

The diagnostic is good, we can see how the residuals are homoschedastic, and there seems not to be any particular leverage effect. This model is good.

We start with a simple linear model:  
[MODEL]  
Checking assumptions of normality, homoschedasticity of the residuals: [same as LM]  
….  
  
Before switching to LMM we do an exploratory analysis to check if it’s really worth using them.  
[BOXPLOT BY GROUP]  
  
We can see that there seems to be a significant difference between groups so it makes sense to try to model this dependence.  
We try first with a LMM with just a random intercept/random intercept+slope:  
[MODEL with bi]  
  
We check the model assumptions, the random effects are normally distributed (QQPLOT) and independent inter-group.  
[diagnostic plot]  
  
  
We take a look at the dot plot to see the point wise estimate and confidence intervals:  
[dotplot]

PVRE:………..  
SCENARIO ANALYSIS:  
We create a new observation with the same var1/var2 and place it in three groups: one -.5std below the mean, one 1.5std above the mean and one approximately close to the mean.  
Predicting the result we can see a great difference: belonging to a group  hanges the prediction from the worst case [value] to the  mean case [value] to the best case [value]

**POINT A)**

**POINT B)**

**POINT C)**

**POINT D)**