**EDF 6481 – Readings for the Class of September 15, 2016**

I hope you will accept my apology for kind of running down in the second half of class last night. It seems that about once a semester I forget my diet and let my blood sugar run down. The result is I have trouble concentrating and just totally mess up ideas I am trying to present. Popper’s notion of falsification is a pretty abstract notion to begin with and I am afraid my explanation went astray when I told you that theories and hypotheses that are easy to reject are the best ones. Of course, the truth it just the opposite. We look for easy to reject hypotheses (which are usually null hypotheses) because we reason that if we continue to fail to reject an easy to reject null hypothesis we can be reasonably confident that the cause of that failure is that the null hypothesis was true.

Below you will find a more detailed explanation of Popper’s idea that I have copied from the manuscript of my first semester statistics textbook that should be published early next year. I hope it will be of help to you. We can discuss this idea further next Thursday.

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| Why Can’t We Test Alternative Hypotheses Directly?  Why bother with null hypotheses? They seem to just confuse things. Why not simply test alternative hypotheses directly? To understand the reason for this we need to look at the work of the 20th century philosopher of science Karl Popper (1902-1994) who first expressed the concept of “falsification.”  Falsification is the notion that while it is impossible to confirm that a hypothesis is true, we can determine that it is false. That is, we can falsify a hypothesis if we know in advance the conditions that must be met to demonstrate the hypothesis is false. The confidence we have in a piece of knowledge, therefore, is a function of how possible it is to falsify this knowledge (i.e., to show that it is wrong). After all, if it were easy to falsify a particular idea, but attempts to falsify it continually fail, we could be pretty confident that the reason the idea was not falsified was that the idea was true. A statement such as “All human beings should be treated with dignity” is so broad that it can never be shown to be wrong (falsified). On the other hand, a statement such as, “Employees who work in a clean and pleasant environment produce more than employees who do not work in environments that are clean and pleasant” is more likely to be falsifiable because it is more specific. Finally, the statement, “There is no difference between the production rates of employees who work in a clean and pleasant environment and those who do not work in a clean and pleasant environment” is even more specific (since it quantifies the difference between the two groups) and is the most easily falsifiable.  Note that the last, and most specific, statement is a null hypothesis. The fact is that nulls are always more specific than alternative hypotheses. The null hypothesis *μ*1 = *μ*2 is very specific. It tells us that the difference between these two population means is exactly zero (*μ*1 - *μ*2 = 0). What is the alternative to this null hypothesis? Ordinarily we would say that it is *μ1*≠ *μ*2 or *μ*1 - *μ*2 ≠ 0. However, this tells us simply that the difference between the population means is not zero. But what *is* the difference between the means? Is it 1? Is it 2? -2? We just don’t know! The alternative hypothesis is not very specific and it is certainly not as specific as the null hypothesis. This makes the null hypothesis easier to falsify and, therefore, we can be more confident of the result we get when we attempt to falsify a null hypothesis than when we attempt to prove an alternative hypothesis. |

In addition, be sure to read the two pieces, one by Karl Popper and a second by one of his critics. Be prepared to discuss both discuss the points made in each article and what you drew from them. In short, read them critically!

Finally, as a group, you threw me off my timing when it turned out that a large number of you had not completed the reading that was assigned for yesterday’s class. I had planned to spend some time discussing Galileo’s Daughter and how the “Galileo affair,” as the Vatican has referred to it, changed how we do inquiry even now. To be frank, I am disappointed that doctoral students could not read an average of 27 pages per day over two weeks! At the beginning of the semester I explained that it was important for you to come to class prepared by at least having done your reading and I recall agreement and consent from the group. This class format will not work if you do not all do your parts.

LBB