An agronomist, investigating the difference in yield (Y) between "black" and "white" varieties of corn (set B), grows 20 pots of each under the same conditions to maturity. Upon harvesting, he finds a considerably higher yield of marketable gain for the white variety. However, he also observes that the white variety averages 7 feet high at flowering time (set A), compared to 6 feet for the black variety. The yield-on-height slopes being the same, he performs an ACV and finds that the adjusted mean yield difference is near zero and nonsignificant.[21] What does this mean?

First, note that the dependent variable is no longer yield (Y), but yield adjusted for flowering height ($Y \cdot A$). The use of ACV does not change the fact of the yield difference of the two varieties.

The assignment of all the yield variance that is shared by height and variety to height alone can not be justified on the usual causal grounds. Rather, height is presumably a property of the variety. However, the results of the analysis *are consistent with* the proposition: the reason for the yield difference is the flowering height difference (or its correlates). We stress "are consistent with" because, of course, such propositions can never be proved in nonexperimental research where assignment to groups is nonrandom (Blalock, 1964, 1971). Yet another way to put this interpretation is that height is a *sufficient* basis on which to account for the yield difference; but this does not mean that it is the *correct* basis. Finally, one can make the purely descriptive statement: black and white plants of the same flowering height have the same (expected) yield. This is a fact about the data at hand, but again any causal interpretation is an assumption and not a product of the analysis.

What are clearly *not* warranted by the results of such analyses are subjunctive formulations like: "*If* black and white varieties *were* of equal height, *then* they would have equal yields." We can not know what the consequences of equal height would be on yield without specifying the means of producing equality in height. We might add fertilizer or water to the black variety, or stretch it when it is young, or use other means to actually equate the varieties. There is no reason to believe that such alternative methods of equating height would have the same consequences, or that any of them would result in equal yields. More technically, such intervention in the process might well change the groups' yield-on-height regression lines, so that those used for adjustment in the analysis are not necessarily descriptive of "what would happen if . . ." Only if heights were equated by excluding short black plants or tall white ones could the regression lines be assumed to hold, and the interpretation be admissible.[22] However, this is not what we usually wish to know. Only by making the appropriate changes that accomplish height equality in a new experiment and determining the consequent yields can the question be answered. Unfortunately, operations analogous to these in behavioral and social science applications are more often than not simply impossible, and such subjunctive questions cannot be answered by ACV or, indeed, by any method of analyzing data.

In closing this section, we wish to lay heavy stress on the fact that APV/ACV is not a mechanical data-massaging procedure, but rather a powerful technique that, perhaps more than others, requires intelligent and substantively knowledgeable use. It is of the utmost importance that the investigator carefully think through the causal implications of "*Y* from which covariates have been partialled," and "equating groups on covariates" to assure himself that they make substantive theoretical sense. Consider the fact that the difference in mean height between the mountains of the Himalayan and Catskill ranges, adjusting for differences in atmospheric pressure, is zero! This is worth pondering . . .