Review of "The Search for Certainty" by Krzysztof Burdzy[1]

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Background

This is all really my fault.

Kevin Spacey famously said that the greatest trick the Devil ever pulled was convincing the world he didn't exist. When it comes to *The Search for Certainty*, a new book on the philosophy of statistics by mathematician Krzysztof Burdzy, the greatest trick involved was getting a copy into the hands of Christian Robert, who trashed it on his blog (Robert, 2010) and then passed it on to me.

My impression what that, setting aside its heated rhetoric involving statistical inference (Bayesian and otherwise), the book was a harmless philosophical exercise which had little if any relevance to statistical practice as I understand it. Burdzy's positive arguments seemed reasonable (if unexceptional) to me, even if his criticisms of others were way off-base.

I posted my thoughts along with a link to Christian's, thus spreading the news to a few thousand readers, including Larry Wasserman, who sent me his own review to post. Edited versions of all these comments, along with Burdzy's reactions, appear in the present issue of this journal. The interested reader might want to read the original blog entries (Gelman, 2010a,b,c), which include lively discussion by many others as well.

My reactions to the book

The flavor of the book is given from this quotation from the back cover: "Similarly, the 'Bayesian statistics' shares nothing in common with the 'subjective philosophy of probability." It's true that in our book (Gelman et al., 2003), we emphasize that Bayesian data analysis does not rely on subjective probability, but . . . "nothing in common"? That's a bit strong.

Rather than attempt to address the book's arguments in general, I will simply do two things. First, I will do a "Washington read" (as is said in the context of political books) and see what Burdzy says about my own writings. Second, I will address the question of whether Burdzy's arguments will have any effect on statistical practice. If the answer to the latter question is no, we can safely leave the book under review to the mathematicians and philosophers, secure in the belief that it will do little mischief.

Burdzy characterizes the discussion of philosophical issues in our book as "level headed and reasonable," which is fair enough. He does criticize us for giving "too many philosophical

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arguments" and for sweeping the "fundamental philosophical problem of verification" under the rug, but that doesn't bother me. Lots has been written on Bayesian philosophy, even by me (Gelman, 2008), and we felt our best contribution in *Bayesian Data Analysis* would be to focus on methods, not on philosophical justifications.

Oddly enough, Burdzy at one point appears to criticize us for discussing subjectivity at all, on the grounds that "standard textbooks on chemistry do not discuss subjectivity in their introductions, and so statistical textbooks need not to do that either . . ." I'm tempted to reply with, "Gee, I'd never thought of it that way," but after an earlier blog discussion I vowed to suppress sarcasm on the grounds that it could be misunderstood. So let me answer this straight by saying that statistics and chemistry are quite different subjects. There's not discussion of isotopes or benzene rings in *Bayesian Data Analysis,* and no discussion of subjectivity and causality in chemistry textbooks. As a professor of political science, I'd just as well not have my statistics textbooks constrained to be a subset of the chemistry curriculum.

Now to the question of what difference Burdzy's book might make. The key point of the book, from my perspective, is its criticism of subjective Bayesian statistics--in Burdzy's words, "the subjective theory does not imply the Bayes theorem." That's fine by me, but of course nothing new if you look at *Bayesian Data Analysis*, chapter 1 (most of which is unchanged from the original 1995 version). I have no problem with Burdzy writing about stuff that I've written on before--obviously, others such as George Box and E. T. Jaynes made similar points before we do--I just don't think Burdzy's claims are as earth-shaking as he apparently believes. (On the back cover, he claims "a radical departure from the current philosophical duality . . . the frequency and subjective theories.")

My guess is that Burdzy would differ very little from Christian Robert or myself when it comes to statistical practice. I believe it's harmless for him to write about Bayesian philosophy--and maybe his book will even be helpful in communicating our ideas to mathematicians who've vaguely heard of Bayesian statistics and mistakenly associate it with subjectivity. Personally, I think this material is covered better in chapter 1 of our book (with side trips to chapters 6, 7, and 8) or, if you want a more philosophical and argumentative perspective, with the appropriate chapters of Berger (1985) and Jaynes (1996), but I suppose that different styles of presentation will be effective with different audiences.

Going beyond "frequentists and subjectivists"

Krzysztof Burdzy and Larry Wasserman were kind enough to send me their reactions to these comments, which I will briefly summarize and respond to here.

Burdzy writes that his goal is not to do philosophy but to reform education and that the foundations of statistics are currently very poorly taught, hence the need for philosophical arguments such as appear in his book. That may be so. From this statistician's perspective, Burdzy's book is unremarkable except in its insistence on its remarkability. However, I admit (and, in act, bemoan) that Bayesian statistics is often associated with subjectivity, in forums ranging from textbooks all the way to Wikipedia. Thus, even if Christian Robert and I do not feel the need to read one more criticism of the frequentist arguments of von Mises or the

subjectivist arguments of de Finetti, these criticisms might be useful to others. I also feel that, should an instructor wish to present a more scientific foundation for Bayesian statistics, he or she would be well advised to begin with chapter 1 of *Bayesian Data Analysis*, but there certainly may be a demand for a more axiomatic treatment.

Larry Wasserman likes *The Search for Certainty* a lot and writes that "Burdzy makes a convincing case that the philosophy of probability is a complete failure." Larry has made important contributions to the theory of Bayesian and non-Bayesian statistics during his career, and when he describes an idea as "interesting and important," it behooves us to listen. This time, however, I disagree, and I think the key to our disagreement is contained in Larry's phrase, "both sides of the philosophical divide." As long as discussion is constrained to be between "frequentists and subjectivists" (in Larry's terminology), the philosophy of probability will remain a failure. But once we more to a more dynamic view of data analysis, which includes model building and checking as well as inference, we can feel a little better about ourselves.

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