

Editorial

Pessimistic Outlook with an Optimistic Outlook

I have been taught (or self-taught) that as a principled statistician I should shy away from extrapolations. I admire the statisticians who have collectively published over 170 articles on extrapolation in journals indexed by the Current Index to Statistics from 1986 to 2006. Many of those recent articles were published in *Risk Analysis* and *Biometrics*, which tells you where the bulk of the applications may be found in the literature. The paper by Fygenson, the first discussion paper in this journal under the editorship of Liou and Meng, piqued my interest more than any other paper that I came across this year because of the two controversial messages that were conveyed: (1) it is possible to tailor predictions to the outlook of a decision maker; and (2) it is even possible to have sufficient confidence, statistically speaking, that such a prediction is useful. The large number of invited and self-invited discussants has made it clear that I am not the only one who worries about extrapolations and predictions.

As I write this, I need to make a personal finance decision as to whether I should continue investing my money in mortgage lenders like Countrywide Credit (symbol CFC, listed on the New York Stock Exchange). I have been a negligible shareholder of CFC for years, but the recent crisis in the secondary market for sub-prime mortgage loans has wiped out the profits of even the best managed companies in this business, and the stock has fallen more than 50% from its recent high. Should I continue to hold the stock (or even buy more) or call it quits? The answer certainly depends on what will happen to the mortgage loan market in the coming years. Wow, this is exactly a problem of extrapolation and prediction! As an investor, I actually cannot stay away from extrapolation and prediction, because even no decision (i.e., holding the stock) is really a decision. Would Fygenson's outlook-based approach help me make such a decision?

I could certainly pore over the historical data. Financial crises such as credit squeezes, interest rate changes, and falling housing prices have happened in the past. Companies that are similar to CFC in characteristics have more than survived in the past, but the problems (and the extent of them) that we are facing today, high proportion of sub-prime loans and widening spread for mortgage loan securities, are outside the “data range”. As an optimist in life, as well as in investing, I believe that the slope of deterioration will moderate and then reverse direction. Under this optimistic outlook, strong companies in the sector will have a high chance to shine after necessary consolidations. Clearly, I decide to hold on to stocks like CFC at the moment. If I were pessimistic in outlook and believed that the negative trend in the credit risk would only accelerate from here, I would choose to sell.

Fygenson’s work has convinced me that sometimes we have to make decisions with extrapolation, and often the decisions have to depend on outlook. The next big question is, of course, how to model and quantify the so-called outlook. Fygenson’s outlook-based approach to prediction and uncertainty estimation may not seem appealing to everyone. In fact, our discussants expressed divergent opinions on how sensible this could be. Some (e.g., Portnoy, Kaiser and Nordman) provided additional or alternative notions of pessimism/optimism as a way to narrow down a class of model distributions to facilitate inference, while some others (e.g., McCullagh and Bernardo) argued that Fygenson’s approach misses a critical ingredient in any decision making business: a loss function that is independent of the model.

Fygenson’s work aims to borrow strengths from the decision theory and game theory, but it is distinct from both. In fact, it does not hand you a decision at all. I must admit that in my example of stock investing my decision to take the risk of riding out the current crisis in the mortgage lending business depends critically on another factor, that is, I have such a small amount of money at stake that I could afford to lose without losing sleep. Maybe everyone agrees that Fygenson’s work is not really about decision making. It is simply a way to model risks in areas where one needs to combine sparse data with a qualitative outlook. Such outlooks may be difficult to incorporate into a

traditional Bayesian framework, but Larsen (discussant) was certainly not discouraged from trying a Bayesian approach that uses “prior opinion”, and Liu (discussant) ventured out to tie the present work with the Dempster-Shafer theory on inference.

To me, the least interesting part of the paper and of the discussion is the use of the Challenger space shuttle disaster as an example. It seems old, sad, and uncontroversial in terms of what decision should have been made. But a number of prominent statisticians analyzed the data in earlier years, and some of the discussants re-visited the example today, which shows that even the least interesting part of the paper is sufficient for a serious discussion! I would like to thank Professor Fygenon for his stimulating contribution to *Statistica Sinica*, and all the discussants for their collective wisdom that helps make *Statistica Sinica* a better journal.

While I will continue to ponder when I should sell my stocks in the mortgage lending business, I hope that the readers of *Statistica Sinica* will find more profitable examples and applications where an outlook-based statistical model can help quantify risk with a fair assessment of uncertainty. If you do not have any example in your immediate surroundings, you may find the discussions by Berger et al. and by Fuh and Hu very informative. The low-dose extrapolation problem discussed in Fygenon’s rejoinder is particularly interesting. In a broad sense, one thing that statisticians are good at is modeling and quantifying uncertainties based on what is observed and what one is led to believe, either by science, experience, or *outlook*. The messages meant to be delivered through Fygenon’s paper are probably not controversial after all.

— **Xuming He**

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