Understanding Non-Bayesians: Sims (2010)

Francis J. DiTraglia

University of Oxford

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Goals of this Presentation

1. Summarize the main points of Sims (2010) - Understanding Non-Bayesians
2. Relate them to the broader discussion of Bayesian vs. Frequentist inference.

I'll put my own commentary and that of others in RED to make it clear when I am not paraphrasing Sims (2010).

Fun Facts

- "Understanding Non-Bayesians" was originally written for the Handbook of Bayesian Econometrics in 2010.
- Oxford University Press objected to Sims posting a pre-print on his website.
- Sims support open access research and withdrew from the handbook in protest; the paper remains unpublished.
- In 2011 Chris Sims was awarded the Nobel Prize in Economics with Tom Sargent for "understanding cause and effect in the macroeconomy."
- Take that OUP!

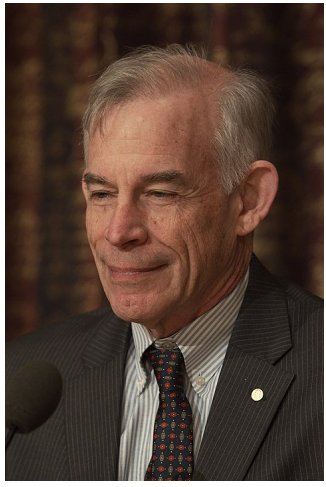

Figure 1: Chris Sims in 2011

Motivation: Why isn't everyone Bayesian?

Once one becomes used to thinking about inference from a Bayesian perspective, it becomes difficult to understand why many econometricians are uncomfortable with that way of thinking. But some very good econometricians are either firmly non-Bayesian or (more commonly these days) think of Bayesian approaches as a "tool" which might sometimes be appropriate, sometimes not.

Figure 2: Laplace in 1775

If we gave credit where credit is really due, we should be calling it "Laplacian Inference" since it was Laplace who first articulated what we would recognize as Bayesian inference.

Introduction

- Difficulty in understanding non-Bayesian perspectives
- Purpose: Articulate counterarguments to Bayesian perspective
- Some counterarguments are easily dismissed
- Others relate to deep questions about inference in infinite-dimensional spaces

Bayesian vs. Frequentist Approaches

Frequentist Approach:

- Sharp distinction between parameters and data
- Works with probability distributions of data, conditional on parameters

Bayesian Approach:

- Treats everything as random before observation
- Aims to construct probability statements about unobserved quantities

Implications for Decision-Making

- Bayesian inference feeds naturally into decision-making under uncertainty
- Frequentist analysis does not directly provide probabilities for decision-makers

Easily Dismissed Objections

1. **"Bayesian inference is subjective"**
   - Bayesians can take an "objective" approach by describing the likelihood
   - Good frequentist practice also involves informal use of prior beliefs
2. **"Bayesian inference is harder"**
   - Often easier to characterize optimal small-sample inference from Bayesian perspective
   - Frequentist asymptotic results can often be given Bayesian interpretations

Less Easily Dismissed Objections

Handy methods that seem un-Bayesian

- IV, GMM, sandwich estimators, kernel methods
- Can be given limited information Bayesian interpretations
- Involve implicit Bayesian judgments in asymptotic theory

Challenges in Non-parametrics

- Infinite-dimensional parameter spaces
- Consistency issues in Bayesian inference
- Pitfalls in high-dimensional spaces:
  - Priors can be unintentionally dogmatic
  - Importance of careful prior specification

Example 1: The Wasserman Problem

- Setup: Observing (ξ, R, Y) with unobserved θ
- Goal: Estimate $\psi = \mathbb{E}[\theta]$
- Bayesian approaches:
  1. Independence case
  2. Dependence case (sieve method)
  3. Limited information approach

Critique of Wasserman's Conclusions

- Bayesian methods are not necessarily insensitive to data
- Importance of appropriate prior specification
- Pitfalls of high-dimensional parameter spaces

Example 2: Robust Variance Estimates in Regression

- OLS with sandwich covariance matrix
- Efficiency bounds (Chamberlain, 1987)
- When is OLS with sandwich appropriate?
  - Large samples
  - Likely nonlinear regression function
  - Interest in best linear predictor

Conclusion

- Bayesian perspective is universally applicable
- Importance of careful modeling in high-dimensional spaces
- Pragmatic Bayesian approach:
  - Recognize limitations of asymptotic approximations
  - Consider model improvements when appropriate
  - Use OLS with sandwich judiciously

Questions?