Statistical Decision Theory and Bayesian Analysis
Chapter 2: Utilities and Losses

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30 April 2015

Reference

§2, James O. Berger, *Statistical Decision Theory and Bayesian Analysis*, Springer, 1985.

This book covers basic materials of statistical decision theory in an easy-to-understand yet critical manner. The prerequisite is rather low.

- Statistical level: moderately serious statistics
- Mathematical level: easy advanced calculus

This slide mainly picks textual materials in Chapter 2. For detailed math, please refer to other resources.

Introduction

In evaluating the consequences of possible actions, two major problems are encountered. The first is that the values of the consequences may no have any obvious scale of measurement.

. . .

Even when there is a clear scale (usually monetary) by which consequences can be evaluated, the scale may not reflect true "value" to the decisionmaker.

Construction of U

> *This process of comparing and recomparing is often how the best judgments can be made.*

My note on $U(r_4) + \alpha U(r_3)+) + (1 - \alpha)U(r_5)$ in p.49:

Even though we may define α as above, it may not reflect our true preference over r_3, r_4 and r_5

No Heaven or Hell

This axiom (Axiom 4) might be objected to, on the basis that a "reward" such as death is infinitely bad. If death was really felt to be infinitely bad compared to other consequences, however, one would never risk the additional chance of dying incurred by, say, crossing a street or driving a car.

Why utility theory?

It should be noted, however, that people do not intuitively tend to act in accordance with a utility function. Thus we are, in essence, defining rational behavior for an individual, and suggesting that such behavior is good.