Chapter 2. CONDITIONING

The most commonly used measures of accuracy of evidence in statistics are *pre-experimental*. A particular procedure is decided upon for use, and the accuracy of the evidence from an experiment is identified with the long run behavior of the procedure, were the experiment repeatedly performed. This long run behavior is evaluated by averaging the performance of the procedure over the sample space $\mathcal{X}$. In contrast, the LP states that *post-experimental* reasoning should be used, wherein only the actual observation x (and not the other observations in $\mathcal{X}$ that could have occured) is relevant. There are a variety of intermediate positions which call for partial conditioning on x and partial long run frequency interpretations. Partly for historical purposes, and partly to indicate that the case for at least some sort of conditioning is compelling, we discuss in this chapter various conditioning viewpoints.

2.1 SIMPLE EXAMPLES

The following simple examples reveal the necessity of at least sometimes thinking conditionally, and will be important later.

EXAMPLE 1. Suppose X_1 and X_2 are independent and

$$P_\theta(X_i = \theta-1) = P_\theta(X_i = \theta+1) = \tfrac{1}{2},\ i = 1,2.$$

Here $-\infty < \theta < \infty$ is an unknown parameter to be estimated from X_1 and X_2. It is easy to see that a 75% confidence set of smallest size for θ is

$$C(X_1,X_2) = \begin{cases} \text{the point } \tfrac{1}{2}(X_1+X_2) & \text{if } X_1 \neq X_2 \\ \text{the point } X_1-1 & \text{if } X_1 = X_2. \end{cases}$$