CHAPTER 1. INTRODUCTION

Among all prescriptions for statistical behavior, the Likelihood
Principle (LP) stands out as the simplest and yet most farreaching. It essen-
tially states that all evidence, which is obtained from an experiment, about an
unknown quantity θ, is contained in the likelihood function of θ for the given
data. The implications of this are profound, since most non-Bayesian approaches
to statistics and indeed most standard statistical measures of evidence (such
as coverage probability, error probabilities, significance level, frequentist
risk, etc.) are then contraindicated.

The LP was always implicit in the Bayesian approach to statistics,
but its development as a separate statistical principle was due in large part
to ideas of R. A. Fisher and G. Barnard (see Section 3.2 for references). It
received major notice when Birnbaum (1962a) showed it to be a consequence of
the more commonly trusted Sufficiency Principle (that a sufficient statistic
summarizes the evidence from an experiment) and Conditionality Principle (that
experiments not actually performed should be irrelevant to conclusions). Since
then the LP has been extensively debated by statisticians interested in founda-
tions, but has been ignored by most statisticians. There are perhaps several
reasons for this. First, the consequences of the LP seem so absurd to many
classical statisticians that they feel it a waste of time to even study the
issue. Second, a cursory investigation of the LP reveals certain oft-stated
objections, foremost of which is the apparent dependence of the principle on
assuming exact knowledge of the (parametric) model for the experiment (so that
an exact likelihood function exists). Since the model is rarely true, (hasty)

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