

PREFACE

The aim of this book is to give an integrated account of statistical inference from a frequentist likelihood-based viewpoint. Classical concepts and results are presented together with more recent developments which have been taking place over the last twenty years. A large part of this research is built upon ideas of R.A. Fisher, hence the term neo-Fisherian. Throughout, emphasis is placed more on general concepts and methods than on mathematical details and regularity conditions.

The volume might be used as a textbook in graduate courses and in advanced undergraduate courses on statistical inference.

Prerequisites include a basic knowledge of inference techniques based on the likelihood function (e.g. at the level of the book by Azzalini, 1996) and some ideas about classical optimality results (e.g. at the level of Beaumont, 1980, or of Bickel and Doksum, 1977). Basic knowledge of probability theory is also required. Measure theory is not essential for understanding most of the topics treated: except for section 3.6.2, measure theory is only used in integrals as a unified notation for continuous and discrete distributions. The basic definitions and results of measure theory used here can all be found in section 1.2 of the book by Lehmann (1983).

Chapters 1-3 are mainly introductory and give a unified view of background material such as: parametric statistical models and likelihood; data and model reduction (sufficiency, conditionality, ancillarity, completeness); optimal procedures and their relation to the Fisherian approach. This preliminary review also considers: moments, cumulants and their generating functions; likelihood and first-order asymptotics; the empirical distribution function. Inference in the presence of nuisance parameters is examined separately in Chapter 4. This includes: extension of data and model reduction concepts; marginal and conditional likelihoods; profile likelihood and orthogonal parameters; basic ideas on partial, quasi- and empirical likelihoods. Exponential families, exponen-

tial dispersion models and generalized linear models, and group families are introduced in Chapters 5-7. The structure and properties of these classes of statistical models are considered together with specific data and model reduction and inference techniques. The last part of the book is devoted to higher-order asymptotic methods. Basic traditional ideas are first described, e.g. variance stabilization and skewness reducing transformations. Index notation and asymptotic expansions for statistics and distributions are then introduced. The final chapter gives an account of some of the major applications to likelihood inference.

Illustrative examples are developed for specific statistical models, while numerical examples with real data sets are not considered here and could be the subject of a parallel or subsequent course on statistical modelling. Each chapter is supplemented with problems and with bibliographic notes.

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L.P.
A.S.