Preface to the Third Edition

The Third Edition of *Testing Statistical Hypotheses* brings it into consonance with the Second Edition of its companion volume on point estimation (Lehmann and Casella, 1998) to which we shall refer as *TPE*2. We won't here comment on the long history of the book which is recounted in Lehmann (1997) but shall use this Preface to indicate the principal changes from the 2nd Edition.

The present volume is divided into two parts. Part I (Chapters 1–10) treats small-sample theory, while Part II (Chapters 11–15) treats large-sample theory. The preface to the 2nd Edition stated that "the most important omission is an adequate treatment of optimality paralleling that given for estimation in *TPE*." We shall here remedy this failure by treating the difficult topic of asymptotic optimality (in Chapter 13) together with the large-sample tools needed for this purpose (in Chapters 11 and 12). Having developed these tools, we use them in Chapter 14 to give a much fuller treatment of tests of goodness of fit than was possible in the 2nd Edition, and in Chapter 15 to provide an introduction to the bootstrap and related techniques. Various large-sample considerations that in the Second Edition were discussed in earlier chapters now have been moved to Chapter 11.

Another major addition is a more comprehensive treatment of multiple testing including some recent optimality results. This topic is now presented in Chapter 9. In order to make room for these extensive additions, we had to eliminate some material found in the Second Edition, primarily the coverage of the multivariate linear hypothesis.

Except for some of the basic results from Part I, a detailed knowledge of small-sample theory is not required for Part II. In particular, the necessary background should include: Chapter 3, Sections 3.1–3.5, 3.8–3.9; Chapter 4: Sections 4.1–4.4; Chapter 5, Sections 5.1–5.3; Chapter 6, Sections 6.1–6.2; Chapter 7, Sections 7.1–7.2; Chapter 8, Sections 8.1–8.2, 8.4–8.5.

Of the two principal additions to the Third Edition, multiple comparisons and asymptotic optimality, each has a godfather. The development of multiple comparisons owes much to the 1953 volume on the subject by John Tukey, a mimeographed version which was widely distributed at the time. It was officially published only in 1994 as Volume VIII in *The Collected Works of John W. Tukey.*

Many of the basic ideas on asymptotic optimality are due to the work of Le Cam between 1955 and 1980. It culminated in his 1986 book, *Asymptotic Methods in Statistical Decision Theory.*

The work of these two authors, both of whom died in 2000, spans the achievements of statistics in the second half of the 20th century, from model-free data analysis to the most abstract and mathematical asymptotic theory. In acknowledgment of their great accomplishments, this volume is dedicated to their memory.

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