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Lindman	Analysis of Variance in Experimental Design

(continued after index)

Harold R. Lindman

Analysis of Variance in Experimental Design

With 31 Figures

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Preface

This is a general text on the analysis of variance. It is aimed at serious students in research with a general background in statistics but with little additional knowledge of mathematics (e.g., graduate students in the biological or social sciences). It begins with applications rather than with abstract concepts such as linear models (which can put off the nonmathematical reader), and the emphasis throughout is on *intelligent* application of the methods; that is, enough theory (including linear models) is developed to enable the reader to choose procedures and to interpret results appropriately.

The text is relatively complete, containing most of the information one needs to perform analyses of variance and related procedures. Thus, although it is designed as a text, it can also serve as a reference. It contains some material (e.g., some multiple comparisons in Chapter 4, and some material on mixed models in Chapter 15) not found previously in general texts on the subject.

It begins at a relatively simple level, but gradually increases in difficulty and generality. One who studies the entire text should not only become knowledgeable about analysis of variance, but should also learn more about statistics in general.

The first eight chapters should be covered in order. Each chapter depends on, and in turn adds to, the material in the previous chapters. Beginning with Chapter 9, more flexibility is possible. A good basic course would cover Chapters 1 through 10. Chapter 11 is somewhat complicated and is not essential for most research.

Chapters 12 through 14 cover multivariate models, including multivariate analysis of variance and analysis of covariance. These are becoming increasingly important in research, largely because computers are now available to do such analyses. However, the computer is a mixed blessing; with the calculations made easy, multivariate analyses are sometimes done without adequate thought as to the nature of the data and the goals of the research. Chapters 12 through 14 give advice on when and how to apply multivariate methods, as well as describe the methods themselves.

Chapter 15 presents an almost completely general linear model for analyzing variance. It gives a general theory covering nearly all of the analyses in the rest of the text. It is also the only chapter with a relatively rigorous, theorem-oriented approach. It is there mainly for those who are curious about the deeper mathematical foundations of the analysis of variance. Those who are interested primarily in applications can ignore it.

There is little emphasis on computers in this text. To begin with, any stress on a particular computer program is likely to make the text dated as soon as the program is revised or superseded by some other program. In addition, I believe that the details of using a program are comparatively easy; it is much more difficult to design a good piece of research, do *appropriate* analyses, and understand the results at the end. Knowing how to use a statistical program does not make one a statistician any more than knowing how to use a word processor makes one a writer. Finally, knowing the calculations, we can better understand and evaluate computer programs designed to do those calculations.

Accordingly, I believe that at least some of the exercises provided should be done by hand with the aid of a pocket calculator or, perhaps, a spreadsheet computer program. (No exercises are given for the final chapters; multivariate analyses of variance are too difficult to do by hand.) However, two popular statistical packages are described in some detail in Appendixes C and D. Each appendix is organized according to the individual chapters. Thus, after reading a given chapter, you can immediately refer to the section of the appendix that relates to that chapter. Alternatively, you can read the entire appendix after studying the rest of the text.

My thanks for assistance in writing this text go primarily to the many students who have suffered through "preprinted" versions while the text was being written. I am grateful not only for their patience but also for their excellent suggestions for improvements and their diligence in finding errors.

Bloomington, Indiana HAROLD R. LINDMAN

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