

COMPARISON PROBLEMS FOR EXPERIMENTS WITH CURVE RESPONSES

Soon B. Hong and Lambert H. Koopmans

Grand Valley State University and University of New Mexico

DEDICATION

David Blackwell was my dissertation professor at the University of California, and generously included me, while I was still a graduate student, as co-author on what became my first published paper. His kindness and consideration set an example I tried to follow with my students throughout my teaching career. This paper was written with my last Ph.D. student before my retirement. We dedicate it, with respect and affection, to David.

LHK

SUMMARY

We consider the problem of comparing treatment effects among two or more groups when the responses of the individuals within groups can be modeled as curves. The curves considered in this study are monotone and the principal application will be to growth curves. The method of analysis involves defining a functional of the curves, then applying standard (possibly robust) one-way ANOVA methods to its values. The functional represents a “generalized” rate of change for the curves. Specifically, the functional values are the slopes of least-squares fitted lines after the curves have been mutually straightened by a power transformation. Thus, in the case of growth curves, the groups are distinguished on the basis of group differences in growth rates. The index of the power transformation is also fitted to the data. Consequently, the small sample properties of the procedure are examined using Monte Carlo simulation.

1. INTRODUCTION

A standard experimental design in biomedical studies involves the application of two or more treatments, each to a separate treatment group, then monitoring the subjects' responses over time. The biological process will be viewed as continuous, so the subjects' responses can be modeled as curves. The