MULTIVARIATE RANKING AND SELECTION PROCEDURES WITH AN APPLICATION TO OVERSEAS TRADE

A thesis presented in partial fulfillment

of the requirements for the degree

of

MASTER OF ARTS

in

STATISTICS

at

MASSEY UNIVERSITY

Name: MARY SHARMILA MENDIS
Year: 1983

To my husband Rohan, our son Ruvan

and

the memory of our son Gerard

ABSTRACT

An overview of some recent work in the field of Ranking and Selection with emphasis on aspects important to experimenters confronted with Multivariate Ranking and Selection problems is presented. Ranking and Selection procedures fall into two basic categories. They are:

1) Indifference Zone Approach
2) Subset Selection Approach.

In these approaches, the multivariate parameters are converted to univariate parameters. Various procedures using these real valued functions are given for both the Indifference Zone Approach and the Subset Selection Approach.

A new formulation that has recently been developed which selects the best multivariate population without reducing populations to univariate quantities is also described. This method is a Multivariate Solution to the Multivariate Ranking and Selection problem.

Finally a real life problem pertaining to New Zealand's overseas trade is discussed in the context of Multivariate Ranking.

ACKNOWLEDGEMENTS

I wish to thank my supervisor Dr. Howard Edwards for his interest and guidance in the preparation of this thesis. Thanks also to Mrs. S. Carlyle for her excellent typing of the manuscript. Finally, I wish to thank my husband Rohan for his help, encouragement and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF COMPUTER PRINTOUTS

CHAPTER 1

1. INTRODUCTION

In the mid nineteen fifties attention began to be drawn to a new type of problem which does not fit into the framework of testing hypotheses and for which no proper statistical approach has been developed. In this type of problem it is not necessary to refute a null hypothesis which is clearly false but rather answer a different type of question which deals with selecting the best or with the ranking of alternatives. This field of study is called RANKING AND SELECTION THEORY.

A statistical Selection procedure uses a random sample from each population to select the best population. The same sample of data is used to order the populations in statistical Ranking procedures. In these procedures it can be asserted with a specified level of confidence that the Selection or Ranking made is correct.

Procedures for Selection and Ranking problems were pioneered by R. E. Bechhofer in 1954 using normality and equal known variance. In the ensuing years such procedures have been developed for more complex problems and in more realistic settings.

This thesis presents an overview of some recent work in this field with emphasis on aspects important to experimenters confronted with Multivariate Ranking and Selection problems. An example pertaining to overseas trade using Multivariate Ranking is also discussed.