A MODIFICATION OF THE GAUSS-JORDAN PROCEDURE AS AN ADEQUATE ALTERNATIVE TO ITERATIVE PROCEDURES IN MULTIPLE REGRESSION

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CHAPTER I

INTRODUCTION

STATEMENT OF THE PROBLEM

This study is an investigation of the Gauss-Jordan procedure modified for use with correlation matrices having linear dependencies. The simplification of the matrix inversion portion in studies of multiple regression would mean educational research could be more easily conducted. More specifically, in the public school setting the guidance counselor would feel more comfortable doing applied research in establishing relationships and testing theories in the field settings.

The traditional approaches for deriving the multiple regression coefficients using the Gauss-Jordan procedure do not usually function in the presence of linear dependencies. Veldman[1] related the Gauss-Jordan procedure programmed in Fortran for the computer.

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[1]Donald J. Veldman, Fortran Programing for the Behavioral Sciences (New York: Holt, Rinehart and Winston, 1967), pp. 156-59.

Typically, the multiple regression program determines the determinant of the correlation matrix in order to check for linear dependency. If the determinant is zero there is linear dependency, execution ceases, and an error statement is printed by the computer. If the determinant is not zero, execution is completed, and the solution is determined, using the Gauss-Jordan procedure.

Another approach for deriving the multiple regression coefficients is the iterative procedure which yields a solution meeting the least squares criterion despite the presence of linear dependencies. Veldman[2] also reported the computer program using iterative techniques to derive the regression coefficients from the correlation matrix.

The Gauss-Jordan procedure provides a direct solution characterized by a specific process executed once, but will not function in the presence of linear dependencies. In contrast, the iterative technique is a cycle of approximations carried out repeatedly until a prescribed accuracy is achieved, but this method is so complicated it is difficult to share with the typical user.

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[2]Donald J. Veldman, Fortran Programing for the Behavioral Sciences (New York: Holt, Rinehart and Winston, 1967), pp. 294-307.

PURPOSE OF THE STUDY

The purpose of the study was to investigate the validity and utility in the modification of the Gauss-Jordan procedure. The matrix inversion technique was suggested by Roscoe and Kittleson.[3]

QUESTIONS FOR THE STUDY

After reviewing literature related to the problem and critically analyzing the modified Gauss-Jordan, questions were developed for this study as follows:

Question 1 -- Does the modified Gauss-Jordan yield results comparable to the iterative procedure cited above in the presence of various kinds of linear dependencies?

Question 2 -- How does the efficiency (in terms of computer time used) of the modified Gauss-Jordan compare to that of the iterative procedure which is widely used by educational researchers?

Question 3 -- Can the modified Gauss-Jordan be conveniently altered to calculate the rank of the matrix?

[3]John T. Roscoe and Howard M. Kittleson, "A Modified Gauss-Jordan Procedure as an Alternative to Iterative Procedures in Multiple Regression" (Paper prepared for presentation at the annual convention of the American Educational Research Association, February, 1971, New York City, New York).