PROGRAM ABSTRACTS/ALGORITHMS

IPA1: A BASIC program to conduct an interactive path analysis

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When one has nonorthogonal variates, one frequently uses factor analysis or some other form of correlational analysis. A popular alternative to factor analysis, when there seems to be an a priori causal ordering among the variates, is path analysis (see, for example, Namboodiri, Carter, & Blalock, 1975; Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975; on the interrelationship between factor analysis and path analysis, see Allan, 1974).

A common feature of programs to perform path analysis is that the programs are written in FORTRAN and are batch (although an interactive path analysis subprogram is being written for the planned "Interactive SPSS"). IPA1 is written in BASIC and allows an on-line development of causal models by researchers and students. The lower half of a correlation matrix is read by BASIC READ statements: This is so because it is assumed that the correlations have been calculated by some other program, or that one is investigating a published correlation matrix.

The program is invaluable for teaching multivariate methods to undergraduates, and it is a useful exploratory research tool. Output from the program consists of the proportion of variance explained and the beta

(path) coefficients. No tests of statistical significance are given, although the program can be easily modified to give standard errors and F ratios.

Program Specifications. IPA1 is written for the SOBS BASIC interpreter, which runs under MAXIMOP system on the ICL 1900 series. There are no limitations on the size of the correlation matrix, apart from those set by the amount of core storage and the efficiency of the BASIC INV facility. Apart from the dimension of the matrix and the matrix itself (lower half), which are set in DATA statements (to minimize error and allow an easier restart), all parameters are input from the console. The program is small and should be easily loaded into a small computer, as long as the interpreter allows dynamic array dimensions.

Availability. Reprints of this article and listings of the program with a test run can be obtained at no cost from G. J. Boris Allan, Department of Social Science, Manchester Polytechnic, Aytoun Street, Manchester, England M1 3GH.

REFERENCES

- ALLAN, G. J. B. Simplicity in path analysis. *Sociology*, 1974, 8, 197-212.
- NAMBOODIRI, N. K., CARTER, L. F., & BLALOCK, H. M. *Applied multivariate analysis and experimental designs*. New York: McGraw-Hill, 1975.
- NIE, N. H., HULL, C. H., JENKINS, J. G., STEINBRENNER, K., & BENT, D. H. *Statistical package for the social sciences*. New York: McGraw-Hill, 1975.

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Appendix Program Listing of IPA1

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10      GOSUB 560
20      PRINT "PATH ANALYSIS PROGRAM"
30      PRINT
40      PRINT
50      READ N
60      DIM R(N,N)
70      FOR I=1, TO N
80          LET R(I,I)=1
90      NEXT I
100     FOR I=2 TO N
110         FOR J=1 TO I-1
120             READ R(I,J)
130             LET R(J,I)=R(I,J)
140         NEXT J
150     NEXT I
160     PRINT
170     PRINT "CHECK YOUR INPUT"
180     MAT PRINT R,
190     PRINT
200     GOSUB 560
210     PRINT "WHAT IS THE NUMBER OF YOUR DEPENDENT VARIABLE ?";
220     INPUT A1
230     PRINT "HOW MANY INDEPENDENT VARIABLES ?";
240     INPUT M

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Appendix Continued

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250      DIM A(M+1), B(M+1, M+1), C(M+1, M+1)
260      PRINT "TYPE-IN THEIR VARIABLE NUMBERS ONE AT A TIME"
270      LET A(1)=A1
280      FOR I=2 TO M
290      INPUT A(I)
300      PRINT "AND THE NEXT"
310      NEXT I
320      INPUT A(M+1)
330      FOR I=1 TO M+1
340      FOR J=1 TO M+1
350      LET B(I,J)=R(A(I), A(J))
360      NEXT J
370      NEXT I
380      MAT C = INV(B)
390      PRINT "VARIANCE EXPLAINED IS" ; 1 - 1/C(1,1)
400      PRINT
410      PRINT "VARIABLE", "PATH COEFFICIENT"
420      FOR I=2 TO M+1
430      PRINT A(I), -C(1,I)/C(1,1)
440      NEXT I
450      PRINT
460      PRINT "DO YOU WISH TO PERFORM ANOTHER PATH ANALYSIS"
470      PRINT "USING A SUBSET OF THESE ";N;" VARIABLES ?"
480      PRINT "ANSWER YES OR NO";
490      INPUT A£
500      IF A£="YES" THEN 200
510      IF A£="NO" THEN 530
520      GOTO 480
530      STOP
540      END
550      PRINT
560      PRINT
570      FOR L=1 TO 65
580      PRINT "*";
590      NEXT L
600      PRINT
610      PRINT
620      PRINT
630      RETURN
```