INFORMATION: A FORTRAN IV program for converting information values into probabilities, odds, and evidence values

AMNON TILL and RON AVRAHAMI

Victoria University of Wellington, Wellington, New Zealand

Till (1977) ran a series of programs that converted probabilities (p), odds (O), and evidence (E) into each other. He also transformed the values of probabilities into the corresponding values of information using the equation:

$$I = -p \log_2 p. \quad (1)$$

However, the previous program did not transform the values of information into the corresponding probability values. The present program, INFORMATION, is designed to achieve this goal, and, in addition, to produce a general table which converts information values into the corresponding probabilities, odds, and evidence values.

Adding $p \log_2 p$ to the two sides of equation (1) we obtain the new equation:

$$I + p \log_2 p = O. \quad (2)$$

On the basis of Equation 2, we define a new function:

$$F(I) = I + p \log_2 p. \quad (3)$$

To solve for p for a given value of I , we have to solve Equation 3, where

$$F(I) = I + p \log_2 p = O. \quad (4)$$

To do this we use the bisection method (or the interval halving method (Hildebrand, 1974).

Once the value of p that corresponds to the value of I has been found, it can then be transformed to the

corresponding values of odds (O) and evidence (E) using Equations 5 and 6:

$$O = \frac{p}{1-p} \quad (5)$$

$$E = 10 \log_{10} O. \quad (6)$$

Because of the nature of the relationship between information and probability, each information value has two probability values corresponding to it.

The Program. INFORMATION is a FORTRAN IV program designed to increment information in steps of .01 and to transform each information value to the corresponding values of probability, odds, and evidence.

Input. Information values varying from .01 to .53 in steps of .01 are generated as an input for this program.

Output. The probabilities, odds, and evidence values associated with the corresponding information values are generated as an output for this program.

Restriction. The program INFORMATION is written in FORTRAN IV, so any computer system that supports FORTRAN IV will run it. It takes 6.8 sec to run on the B 6700 Computer.

Availability. A copy of the listing, documentation, and sample of the output can be obtained free of charge by writing to Amnon Till, Department of Psychology, Victoria University of Wellington, Private Bag, Wellington, New Zealand.

REFERENCES

- HILDEBRAND, F. B. *Introduction to numerical analysis*. New York: McGraw Hill, 1974.
TILL, A. CONVERSION: A series of FORTRAN IV programs for converting probabilities, odds, evidence and information measures into one another. *Behavior Research Methods & Instrumentation*, 1977, 9, 515-516.

(Accepted for publication October 20, 1977.)