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CYCLES: A FORTRAN IV program for the analysis of periodicity in time series data

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Variability of a cyclic nature is often encountered in repeated measures. The investigator may be interested either in removing such cyclic variability or in identifying the sources of nonrandom fluctuations. One method for determining the presence of cycling in time series data is through the use of an autocorrelation technique. The correlogram (i.e., the plot of autocorrelations for successive lags) reflects not only the degree of dependency in the data, but also the presence of systematic oscillations. Peak-to-peak differences in the correlogram reflect the period of the dominant cycle in the time series (Wieland & Mefferd, 1969).

CYCLES was developed to fulfill the need for computerized correlogram analysis and to provide the investigator with the time pattern of cycling in the data. If the investigator desires to remove this source of variability from the data, averaging over the identified dominant period accomplishes this while avoiding misrepresentation of the existing pattern in the raw data (Wieland & Mefferd, 1970). Alternatively, the identified period may be used in other forms of periodicity analysis, such as the methods described by Bloomfield (1976).

Description. The present program uses the autocorrelation computational formula found in Bower, Padia, and Glass (1974). The initial run of the program produces a tabular representation of the peak autocorrelations in the correlogram. Peaks are determined by differencing successive lag autocorrelations. Following inspection of this output, the investigator has the option of reexecuting the program in order to determine the period length of the dominant cycle. Less systematic cycling is excluded by the input of an autocorrelation criterion cutoff.

Input. The job deck consists of the following cards. Card 1 is the alphanumeric title. Card 2 contains an option for printing all autocorrelations and an option for computing peak-to-peak differences, in addition to an autocorrelation criterion cutoff to be used in differencing. Card 3 is the data format card (F-type variable format). The next cards contain the raw data. Each card must contain only one data point.

Output. The printed output includes all autocorrelations and associated lag numbers. Positive inflection points in the correlogram and associated autocorrelations are also output. If peak-to-peak differencing is chosen, then frequency counts for each lag difference are provided. Also output are the job title, mean, standard deviation, and variance of the time series. The average frequency of cycling in the data and its conversion into radians per unit time (omega) are printed. These estimates may be useful for further analysis (Bloomfield, 1976).

Computer and Language. The program was written in FORTRAN IV and was tested on a DEC 20 computer. The program requires 6.5 sec to compile and run. This estimate is based on a run with 600 data points. The total source deck contains 234 cards including 121 comment cards.

Availability. A fully documented listing of the program can be obtained at no charge from the authors: Lee Baer and D. K. Ahern, Psychology Department, Nova University, 3301 College Avenue, Fort Lauderdale, Florida 33314.

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