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TEST OF THE RANDOMNESS OF THE SERIES OF OCCURRENCES OF DEPRESSIONS/CYCLONES IN THE BAY OF BENGAL

1. Introduction

A statistical study of frequency of depressions/cyclones in the Bay of Bengal has been made by Rao and Jayaraman (1958). In their work they furnish tables showing the monthly, seasonal and annual frequencies of this phenomena. It is felt that it would be of interest to test the randomness of the series of occurrences of depressions/cyclones in the Bay of Bengal.

A series of observations may be regarded as a statistical sequence of variates. If the variation of this sequence is entirely random, the successive values are independent and the series may be the chance arrangement of a sample from some unknown population.

2. Method

The testing of the randomness of the series which is adopted in the present investigation, is by means of correlation methods.

3. Serial correlation

If $x_1, x_2 \ldots\ldots\ldots\ldots\ldots x_n$ denote the sequence to be tested, the cross product term

$$R = \sum_{i=1}^{n} x_i \, x_{i+1}$$

where $x + 1 = x_1$ differs considerably from

TABLE 1

	R	$E(R)$	σ_R	$y(R) = \frac{R-E(R)}{R}$
Annual	10491	10458	81·1	0·41
Jun-Sep	3326	3344	12·3	—1·50
Oct-Nov	741	737	28·9	0·14

the cross product term $\sum_{i=1}^{n} x_i y_i$ in the ordinary correlation coefficient. It is well known that for large values of n, R possesses an approximate normal dist.ibution which may be used to test the hypothesis of zero serial correlation. For such a test, only the mean and variance of R are necessary. These values are given by the formulae

$$E(R) = (S_1^2 - S_2) / n-1 \quad \text{and}$$

$$\sigma^2_R = \frac{S_2^2 - S_4}{n-1} +$$

$$\frac{S_1^4 - 4S_1^2 S_2 + 4S_1 S_3 + S_2^2 - 2S_4}{(n-1\ (n-2)} - E^2(R)$$

where $S_k = x_1^k + x_2^k + \ldots\ldots + x_n^k$

The test based upon R is selected here because of its simpler form and also since it is equivalent to a test based upon the serial correlation coefficient with lag 1.

The results of the analysis are given in Table 1. It will be seen that the expression

$$y(R) = \frac{R-E(R)}{R}$$

has an insignificant value, in the all cases considered. It, therefore, can be concluded that the series is a random one.

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