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PERSISTENCE FACTOR IN SQUALL OCCURRENCE AND RAINFALL

Data for squall occurrence at Nagpur and rainfall for few stations in India has been examined to see persistence effect in it. Persistence ratio is defined as the ratio of the mean length of runs of occurrences in a series of observations to the mean length in a random series in which the general probability p of occurrence is same.

Criterion of Persistence—A series is purely random theoretically, if the persistence ratio or factor is unity. It is generally accepted that there is no evidence of departure from randomness, unless the deviations of a measure from its random value exceed those to be expected on 95 per cent of occasions. Therefore, the 95 per cent confidence limits of the persistence ratio are, $q (q \pm 1.96 \sigma_q)$, $\sigma_q =$ standard error of q , since $q = 1-p$, $\sigma_q = \sigma_p = \sqrt{(pq/N)}$. Therefore, the confidence limits of the persistence ratio are $1/\{1 \pm 1.96\sqrt{(p/N_q)}\}$ (Brooks and Carruthers 1953).

Data of squalls at Nagpur, from March to October (1954—1963), are given below—

Frequency of runs of n squall days

n	1	2	3	4	5	6	7	8
Observed frequencies	147	40	8	3	2	1	0	1

Probability of a squall day = $p = 0.117$.

Probability of a squall if preceding day had a squall = $p_1 = 0.297$. The persistence ratio for squalls at Nagpur = $(1-p)/(1-p_1) = 1.27$. The confidence limits of persistence ratio are 0.99 and 1.16. The value 1.27 is above the confidence limit of 1.16 but does not show strong evidence of persistence whereas the persistence ratio for rainfall at Nagpur as calculated from Srinivasan's (1964) data is 1.54 and its confidence limits are 0.97 and 1.03. The value of 1.54 shows strong persistence as it is quite above 1.03 value which is upper confidence limit.

An examination of rainfall data for few stations in India (Srinivasan 1964) shows

that the persistence ratio varies from 1.25 for Bangalore to 2.68 for Cherrapunji. Baur as quoted by Brooks and Carruthers (1953) gave the value of 1.7 for rainfall persistence factor. Because of persistence factor s , the phenomenon has a tendency to occur in groups of average size s . This causes the lengths of runs to be s times long. Therefore, persistence ratio of 2.68 means that the frequency of rain days is higher for longer lengths of rain spells. It would mean that continuous rain days were more as compared to rain on isolated days.

No doubt, probability increases continuously (Newnham 1916), as the length of the run increases but increase in probability from second to third day is about 30—40 times the probability increase from tenth to eleventh day, as can be seen from Srinivasan's data. Also the probability of rain after five rain days tends to be constant with approximately 5—10 per cent increase. For example, chance of rain on 5th day at Nagpur is about 60 per cent and chance on 11th day is about 66 per cent.

The study shows that (1) the persistence in squall occurrence at Nagpur is not prominent, (2) the persistence factor for rainfall varies roughly from 1.25 to 2.68 in India and (3) the probability of rain after five rain days tends to be constant with approximately 5—10 per cent increase and can be taken to be constant for all practical purposes.

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