MOMENTS ABOUT THE ARITHMETIC MEAN OF A BINOMIAL FREQUENCY DISTRIBUTION

W. J. KIRKHAM, *Oregon State College*

Although the most useful moments of a binomial distribution have been derived as a function of the parameters of the generating binomial for any binomial frequency series, a generalization of notation and procedure is well worth our consideration. The problem attempted in this paper is the calculation of the moments about the mean for the general frequency series of Table I.

TABLE I

The generalized binomial frequency series

x (item)	f (frequency)
0	$N \cdot {}_nC_0 p^0 q^n$
1	$N \cdot {}_nC_1 p^1 q^{n-1}$
2	$N \cdot {}_nC_2 p^2 q^{n-2}$
.	....
.	....
n	$N \cdot {}_nC_n p^n q^0$

In calculating the moments of a set of data about any value, it is often found convenient to use an arbitrary origin, define the moments about this value, and represent the desired moments in terms of those calculated. In the general binomial series, the origin of the x's is found to be the best arbitrary origin. These intermediate moments are

$$\begin{aligned} \nu_1 &= \frac{\sum fx}{N} = M, \text{ arithmetic mean;} \\ \nu_2 &= \frac{\sum fx^2}{N}; \\ &\cdots\cdots\cdots\cdots\cdots \\ &\cdots\cdots\cdots\cdots\cdots \\ \nu_n &= \frac{\sum fx^n}{N} \end{aligned} \tag{1}$$

where ν_i is the i^{th} moment.

The moments (μ's) about the mean are easily defined as functions of the ν's