

ON THE SYSTEMATIC FITTING OF STRAIGHT LINE TRENDS BY STENCIL AND CALCULATING MACHINE

By

HERBERT A. TOOPS,
Ohio State University

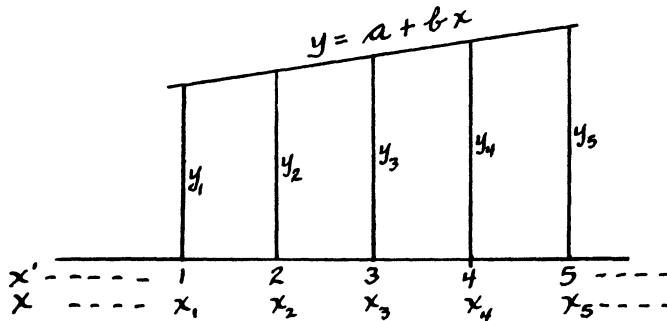
Whenever there is only one plotting point corresponding to N successive abscissal values equally spaced, it is possible greatly to simplify the fitting of straight lines to the empirical observations. Let the N several abscissal values (ordinarily time) be

$$x_1, x_2, x_3, \dots, x_N.$$

Let these several x values be replaced by a series of transmuted steps, x'_i ($i=1, 2, 3, \dots, N$).

Let the several corresponding ordinates be $y_1, y_2, y_3, \dots, y_N$. The situation is represented in Figure 1.

FIG. 1. Illustrating the Notation Employed.



Letting the equation of the fitted straight line be

$$(1) \quad y = a + bx'.$$

it is well known that the solutions, by least squares, for the two constants are,

$$(2) \quad a = \frac{\sum y \cdot \sum (x')^2 - \sum x' \sum x' y}{N \sum (x')^2 - (\sum x')^2},$$

and

$$(3) \quad b = \frac{N \sum x' y - \sum x' \sum y}{N \sum (x')^2 - (\sum x')^2}.$$