

SOME REGRESSION-MODELS FITTED TO THE AGRICULTURAL INCOME-SERIES FOR INDIA (1900-1950)

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The usual deterministic models for the growth of output in a sector over time are,

(1) the linear model $X_t = a + bt$

the assumption being that there is a constant addition of b units in every period of unit time or that the growth is additive,

(2) the exponential model $X_t = ab^t$

the assumption being that the output multiplies itself at the same rate or that the growth is multiplicative and

(3) the logistic model $\frac{K}{1+ae^{-bt}}$

the assumption being that there is a damped multiplicative growth.

There are, of course, other variants of these models that are associated with output-growth such as : (i) a quadratic or in general a polynomial model or the degenerate case of two or more linear models constituting one single model for the whole range, (ii) the modified exponential model and the Gompertz model and (iii) others.

There may be cyclical fluctuations around these long-range growth-paths which are usually represented by one or more cyclical terms. The model may be either of the type

(1) $X_t = \sum P_t + \sum \lambda_1 \cos \mu t + \sum \lambda_2 \sin \mu t$

or of the type

(2) $X_t = \sum P_t \left\{ \lambda_1 \cos \mu_t + \lambda_2 \sin \mu_t \right\}$

where the P_t 's represent the trend mentioned above.

Difference and differential equations for these models which represent the assumptions stated above can be written down and the models obtained as their solutions.

Besides these regular or deterministic components there is the component of the non-deterministic or random fluctuations. These may again be represented as additive or multiplicative in relation to the deterministic

¹ K. Mukerji, "Planning and the Public Sector in an Under-developed Economy", Doctoral Dissertation Calcutta University, 1958, (Unpublished) and A Note on the long-term growth of National Income in India 1900-01 to 1952-53", Paper presented at the 2nd Indian Conference of Research in National Income 1960, (Unpublished).