Extrapolation

In mathematics, the interpolation and extrapolation are two important terminologies. **Interpolation** may be defined as an estimation be **extrapolation** is a process in which the value is estimated beyond the specific range of given variable. It provides the estimate of the

Extrapolation may be referred to the mathematical prediction of the value of some variable based on the relationship which is given in more uncertainty and greater risk of getting meaningless or wrong results.

The process of extrapolation was first introduced by **Thomas D. Clareson** in nearly **1959** in his book about science and fiction. Extrap assuming that similar process would be applicable beyond the given data too. Extrapolation is an important concept used not only in m psychology, human experience etc.

For Example: when we drive, we usually extrapolate about the road conditions be

Extrapolation may be referred as a method in which data values are considered as points such as x_1, x_2..., x_n and then, a value is app exists in statistical data because this has been experienced very often that if the data is sampled periodically, it approximates next data history is considered and a predicted future pattern is extrapolated.

We are going to discuss about mathematical extrapolation in this page below. So, go ahead with us and have a better understanding a

Definition

The word "**extrapolation**" starts with the word "**extra**" which means "**outside**". Just as interpolation which refers to insertion of someth be defined as the insertion outside any two given points. Extrapolation is said to be an opinion or an estimate about something extract an area that is not known, in order to arrive at a conjectural knowledge of unknown area.

This concept may also be referred to the prediction of an image of future assuming present and past trends true. The method of extrap to be similar in future too. In this way, the future outcomes can be predicted. An extrapolation may be thought as a hypothesis or a ma given in the present situation and makes predictions about something that might eventually happen.

For Example : If we have some information about Sunday, Monday and Tuesday, we might be able to extrapolate about Wednesday

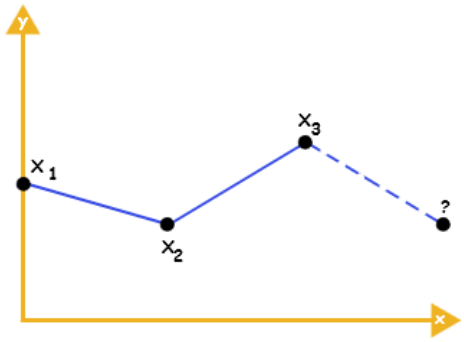
An example of interpolation may be locating a point between the two given endpoints of a straight line; while extrapolation i.e. beyond its two extremes by extending the line in either direction.

Extrapolation: estimating values a = 8 and b = 10 outside the given series 0, 2, 4, 6, a, b

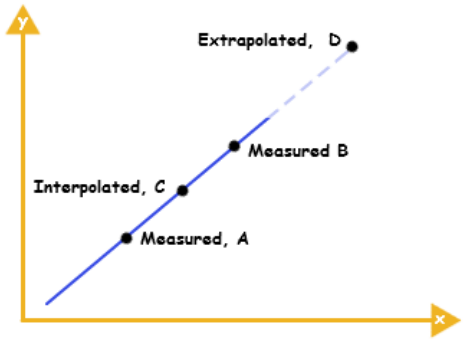
Extrapolation Graph

Extrapolation can be understood with the help of following graphs:

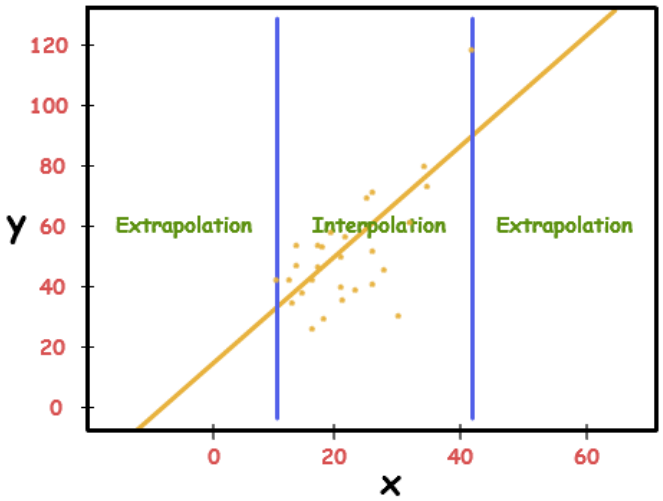
1) Extrapolation is the process of predicting information about a point outside a curve when few points on the curve are given. In the g point x_4 is extrapolated.



2) An example of a linear extrapolation is given in the graph shown below. Here, the line segment AB is given. The point C is interpola beyond AB.



3) In the following graph, scatter chart of few points is given. where the points falling within the certain limits (between two lines) are in



Formula and Methods

The main methods and formulas of extrapolation are explained below.

Linear Extrapolation:

The method of linear extrapolation is useful when a linear function is given. It is done by drawing a tangent line at the endpoint of giver provide good results when the point to be predicted is not too far from the given data.

Let us assume that the two endpoints of a linear graph be (x_1, y_1) and (x_2, y_2) and the value of the point x is to be extrapolated; then

Exploration Formula: $y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1)$

Polynomial Extrapolation:

We know that three points give a unique polynomial. The polynomial curve can be extended after the end of the given data. The polyn **finite difference** or with the use of **Lagrange's interpolation** formula. Higher-order polynomial must be extrapolated with due care; b and if it occurs, the error estimate of extrapolated value would grow exponentially with the degree of polynomial.

Conic Extrapolation:

Just to recall that a conic section can be created with the help of 5 points given near the end of the data. In case, the conic section is a

curve itself. The parabola or hyperbola will never rejoin itself. But these may be curved back related to X-axis. Conic extrapolation can computer.

Examples

Few examples based on extrapolation are illustrated below:

Example 1: Extrapolate the unknown points in the following given series:
1) 1, 4, 9, 16, 25, 64, x
2) 45, 38, 31, 24, 17, 10, y

Solution:
1) 1, 4, 9, 16, 25, 64, x
= 1^2, 2^2, 3^2, 4^2, 5^2, 6^2, x

Therefore x should be equal to 7^2
So, x = 49

2) 45, 38, 31, 24, 17, 10, y
= 45, 45 - 7 = 38, 38 - 7 = 31, 31 - 7 = 24, 24 - 7 = 17, 17 - 7 = 10, y

Hence y should be equal to 10 - 7
So, y = 10 - 7 = 3

Example 2: The endpoints of a straight line are given by (0.3, 0.8) and (1.8, 2.7). Extrapolate the value of x = 2.3.

Solution: Here, $x_1 = 0.3$, $y_1 = 0.8$
and $x_2 = 1.8$, $y_2 = 2.7$

The formula for linear extrapolation is as follows:

$$y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1)$$

$$y(2.3) = 0.8 + \frac{2.3 - 0.3}{1.8 - 0.3}(2.7 - 0.8)$$

$$= 0.8 + \frac{2}{1.5}(1.9)$$

$$= 0.8 + \frac{38}{15}$$

$$= 0.8 + \frac{38}{15}$$

$$= \frac{10}{3}$$

$$y(2.3) = 3.33$$

Example 3: The two known points lying on a straight line are (0, 7) and (3, 10). Find the value of y at x = 4.5 on this straight line usir
Solution: Here, $x_1 = 0$, $y_1 = 7$
$x_2 = 3$, $y_2 = 10$

The formula for linear extrapolation is as follows :

$$y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1)$$

$$y(4.5) = 7 + \frac{3}{2}(3)$$

$$= 7 + 4.5$$

$$y(4.5) = 11.5$$

◀◀ Closed Interval

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