

# Methods of Constructing Index Numbers

## (1) Simple (Unweighted) Aggregate Method:

$$P_{01} = \frac{\sum P_1}{\sum P_0} \times 100 \rightarrow \text{Price Index}$$

$\sum P_1$ : the aggregate of prices (of all the selected commodities) in the current year.

$\sum P_0$ : Aggregate of prices in the base year.

$$Q_{01} = \frac{\sum Q_1}{\sum Q_0} \times 100 \rightarrow \text{Quantity Index}$$

$\sum Q_1$ : Aggregate of quantities of all selected commodities consumed in the current year.

$\sum Q_0$ : Aggregate of quantities in the base year.

Ex

Commodity	Price (in Rupees)	
	1980 ( $P_0$ )	1981 ( $P_1$ )
A	162	171
B	256	164
C	257	189
D	132	145
Total	$\sum P_0 = 807$	$\sum P_1 = 669$

The Price index using Simple Aggregate Method:

$$P_{01} = \frac{\sum P_1}{\sum P_0} \times 100$$

$$= \frac{669}{807} \times 100$$

$$= 82.90 \%$$

## (2) Weighted Aggregate Method

In this method, appropriate weights are assigned to various commodities to reflect their relative importance in the group.

$$P_{01} = \frac{\sum w P_1}{\sum w P_0} \times 100$$

There are different formulas based on weighted index:

### (a) Laspeyres's Price Index

by French Economist Laspeyres (1817.)

$$P_{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$$

### (b) Paasche's Price Index

$$P_{01} = \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times 100$$

by German Statistician Paasche (1874).

### (c) Darbish - Bowley Price Index

This index is given by the arithmetic mean of Laspeyres's and Paasche's price index numbers.

$$P_{01} = \frac{1}{2} \left[ \frac{\sum P_1 Q_0}{\sum P_0 Q_0} + \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \right] \times 100$$

Also known as L-P formula.

### (d) Fisher's Price Index:

Irving Fisher advocated the geometric mean of Laspeyres and Paasche's price index numbers.

$$P_{01} = \left[ \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \right]^{1/2} \times 100$$

This is ~~termed~~ termed as an ideal index since it satisfies time reversal and factor reversal tests for the consistency of index numbers.

### (e) Marshall-Edgeworth Price Index:

Taking the arithmetic mean of the quantities in the base year and the current year as weights.

$$P_{01} = \left[ \frac{\sum P_1 Q_0 + \sum P_1 Q_1}{\sum P_0 Q_0 + \sum P_0 Q_1} \right] \times 100$$

### (f) Walsh Price Index:

Instead of taking the arithmetic mean of base year and current year quantities as weights, if we take their geometric mean.

$$P_{01} = \frac{\sum P_1 \sqrt{Q_0 Q_1}}{\sum P_0 \sqrt{Q_0 Q_1}} \times 100$$

### (g) Kelly's Price Index or Fixed Weights Index:

Name after Thomas L. Kelly, requires the weights to be fixed for all periods.

$$P_{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$$

Also known as aggregative index with fixed weights.

Reference: Fundamentals of Statistics by S.C. Gupta.