Pinky Rani
Guest Faculty
Department of Economics
Maharaja College
Veer Kunwar Singh University, Ara
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CLASSIFICATION OF INDEX NUMBERS

There are three principal types of indices: price indices, quantity indices, and value indices.

Price Indices: This type of indices is the most frequently used. Price indices consider prices of a commodity or a group of commodities and compare changes of prices from one period to another period and also compare the difference in price from one place to another. For example, the familiar Consumer Price Index measuring overall price changes of consumer commodities and services is used to define the cost of living.

Quantity Indices: The major focus of consideration and comparison in these indices are the quantities either of a single commodity or a group of commodities. For example, the focus may be to understand the changes in the quantity of paddy production in India over different time periods. For this purpose, a single commodity's quantity index will have to be constructed. Alternatively, the focus may be to understand the changes in food grain production in India, in this case all commodities which are categorized under food grains will be considered while constructing the quantity index.

Value Indices: Value indices actually measure the combined effects of price and quantity changes. For many situations either a price index or quantity index may not be enough for the purpose of a comparison. For example, an index may be needed to compare cost of living for a specific group of persons in a city or a region. Here comparsion of expenditure of a typical family of the group is more relevant. Since this involves comparing expenditure, it is the value index which will have to be constructed. These indices are useful in production decisions, because it avoids the effects of inflation.

The formula, therefore is:

$$\text{Value indices} = \frac{\Sigma p_1 q_1}{\Sigma p_1 q_1} \times 100$$

Selection of Method:

The selection of a suitable method for the construction of index numbers is the final step.

There are two methods of computing the index numbers:

(a) Simple index number and

(b) Weighted index number.

Simple index number again can be constructed either by – (i) Simple aggregate method, or by (ii) simple average of price relative's method. Similarly, weighted index number can be constructed either by (i) weighted aggregative method, or by (ii) weighted average of price relative's method. The choice of method depends upon the availability of data, degree of accuracy required and the purpose of the study.

Construction of Price Index Numbers (Formula and Examples):
Construction of price index numbers through various methods can be understood with the help of the following examples:

1. Simple Aggregative Method:

In this method, the index number is equal to the sum of prices for the year for which index number is to be found divided by the sum of actual prices for the base year.

The formula for finding the index number through this method is as follows:

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

Where P_{01} Stands for the index number

ΣP_1 Stands for the sum of the prices for the year for which index number is to be found :

ΣP_0 Stands for the sum of prices for the base year.

Commodity	Prices in Base Year 1980 (in Rs.) P_o	Prices in current Year 1988 (in Rs.) P_1
A	10	20
B	15	25
C	40	60
D	25	40
Total	$\Sigma P_0 = 90$	$\Sigma P_1 = 145$

Index Number $(P_{01}) = \frac{\Sigma P_1}{\Sigma P_0} \times 100$; $P_{01} = \frac{145}{90} \times 100$; $P_{01} = 161.11$

2. Simple Average of Price Relatives Method:

In this method, the index number is equal to the sum of price relatives divided by the number of items and is calculated by using the following formula:

$$P_{01} = \frac{\Sigma R}{N}$$

Where ΣR stands for the sum of price relatives i. e. $R = \frac{P_1}{P_0} \times 100$ and

N stands for the number of items.

Example

Commodity P_0	Base Year Prices (in Rs.) P_1	Current year Prices (in Rs.)	Price Relatives $R = \frac{P_1}{P_0} \times 100$
A	10	20	$\frac{20}{10} \times 100 = 200.0$
B	15	25	$\frac{25}{15} \times 100 = 166.7$
C	40	60	$\frac{60}{40} \times 100 = 150.00$
D	25	40	$\frac{40}{25} \times 100 = 160.0$
N = 4			$\Sigma R = 676.7$

$$\text{Index Number } (p_{01}) = \frac{\Sigma R}{N}$$

$$P_{01} = \frac{676.7}{4} ; P_{01} = 169.2$$

3. Weighted Aggregative Method:

In this method, different weights are assigned to the items according to their relative importance. Weights used are the quantity weights. Many formulae have been developed to estimate index numbers on the basis of quantity weights.

Some of them are explained below:

(*i*) **Laspeyre's Formula.** In this formula, the quantities of base year are accepted as weights.

$$P_{01} = \frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times 100$$

Where P_1 is the price in the current year ; P_0 is the price in the base year ; and q_0 is the quantity in the base year.

(*ii*) **Paasche's Formula.** In this formula, the quantities of the current year are accepted as weights.

$$P_{01} = \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1} \times 100$$

Where q_1 is the quantity in the current year.

(*iii*) **Dorbish and Bowley's Formula.** Dorbish and Bowley's formula for estimating weighted index number is as follows :

$$P_{01} = \frac{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} + \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}}{2} \times 100 \quad \text{or} \quad p_{01} = \frac{L + P}{2}$$

Where L is Laspeyre's index and P is paasche's Index.

(*iv*) **Fisher's Ideal Formula.** In this formula, the geometric mean of two indices (i.e., Laspeyre's Index and paasche's Index) is taken :

$$p_{01} = \sqrt{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}} \times 100 \quad \text{or} \quad P_{01} = \sqrt{L \times P} \times 100$$

where L is Lespeyre's Index and P is paasche's Index.

Example

Comm-odity	Base Year		Current Year		P_0q_0	P_1q_0	P_0q_1	P_1q_1
	P_0	q_0	P_1	q_1				
A	10	5	20	2	50	100	20	40
B	15	4	25	8	60	100	120	200
C	40	2	60	6	80	120	240	360
D	25	3	40	4	75	120	100	160
Total					265 ΣP_0q_0	440 ΣP_1q_0	480 ΣP_0q_1	760 ΣP_1q_1

(*i*) Laspeyre's Formula :

$$p_{01} = \frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times 100$$

$$p_{01} = \frac{440}{265} \times 100 = 166.04$$

(*ii*) Paasche' Formula :

$$p_{01} = \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1} \times 100$$

$$p_{01} = \frac{700}{480} \times 100 = 158.3$$

(*iii*) Dorbish and Bowley's Formula :

$$p_{01} = \frac{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} + \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}}{2} \times 100 = 162.2$$

$$p_{01} = \frac{\frac{440}{265} + \frac{760}{480}}{2} \times 100 = 162$$

(*iv*) Fisher's Ideal Formula :

$$p_{01} = \sqrt{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}} \times 100$$

$$p_{01} = \sqrt{\frac{440}{265} \times \frac{760}{480}} \times 100 = 162.1$$

4. Weighted Average of Relatives Method:

In this method also different weights are used for the items according to their relative importance.

The price index number is found out with the help of the following formula:

$$P_{01} = \frac{\Sigma RW}{\Sigma W}$$

where ΣW stands for the sum of weights of different commodities :
and ΣR stands for the sum of price relatives.

Commodity	Weights W	Base Prices Year P_0	Current Year Prices P_1	Price Relatives $R = \frac{P_1}{P_0} \times 100$	RW
A	5	10	20	20/10 × 100 = 200.0	1000.0
B	4	15	25	25/15 × 100 = 166.7	666.8
C	2	40	60	60/40 ×100 = 150.0	300.0
D	3	25	40	40/25 × 100 = 160.0	480.0
Total	ΣW=14				ΣRW = 2446.8

Index Number $(P_{01}) = \frac{\Sigma RW}{\Sigma W}$

$$p_{01} = \frac{2446.8}{14} = 174.8$$

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