

# INDEX NUMBERS

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## Index Numbers

Introduction "An index number is a statistical measure, designed to measure changes in a variable or a group of related variables. For example A price index"

Meaning :- Index numbers is an important statistical technique with the help of which we measure changes in a variable or group of related variables with respect to time and place. When a price index is constructed, a single figure is obtained to indicate the extent and direction of change in price of different services.

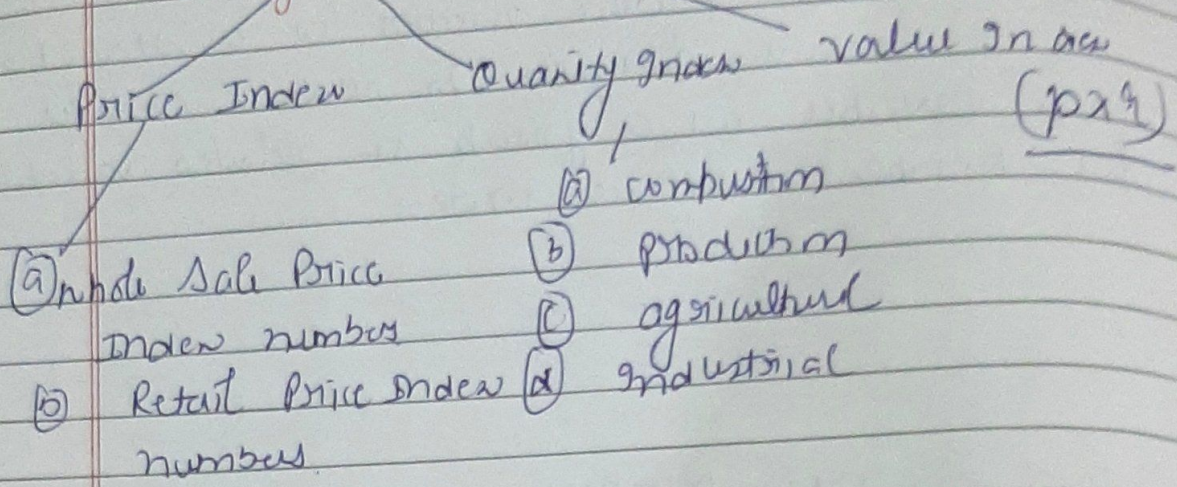
Definition - Index numbers are like economic barometers. They are used to take the pulse of the economy and they have come to be used as indicators of inflationary and deflationary tendencies.

### Features of Index numbers

1. Index numbers are special type of averages.
2. Index numbers are measures the changes variable or group of related variables.



## Types of Index numbers



## Uses / Importance of Index numbers

- I) Index numbers help in study Trends.
- II) Index numbers help in formulation of policies.
- III) Index numbers are useful in measuring purchasing power of money.
- IV) Index numbers help in simplifying data.
- V) Index numbers act as Economic Barometer.

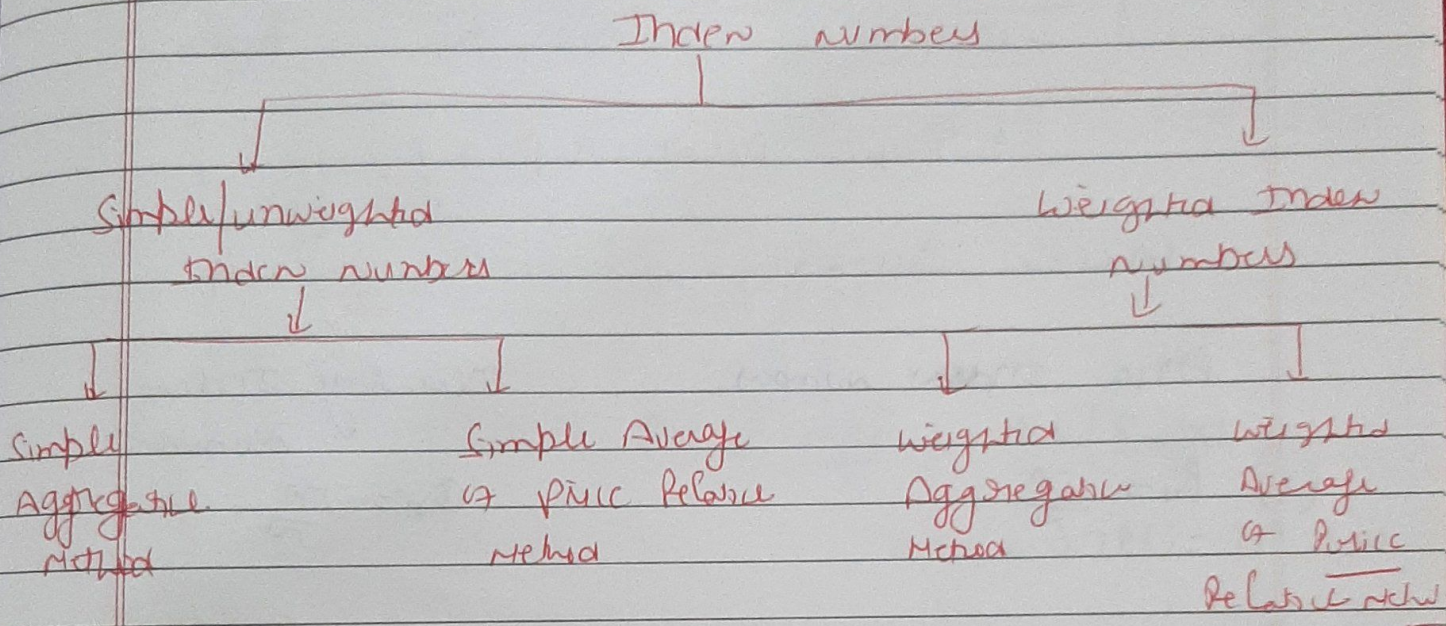
## Methods of constructing Index numbers

- I) unweighted index number → unweighted index numbers are supposed to include the items which are of equal importance.
  - (a) Simple Aggregate Method
  - (b) Simple Average of Price Relatives Method



2 Weighted Index Numbers:- (a) weighted Aggregate method.

(b) weighted Average of Price Relatives method



Simple Aggregate method

Price Index numbers

$$P_{01} = \frac{\sum p_1}{\sum p_0} \times 100$$

Quantity Index numbers

$$Q_{01} = \frac{\sum q_1}{\sum q_0} \times 100$$

II From the following data construct an index number for 2009 taking 2003 as base

Commodities

Price in 2003

Price in 2009

A

100

140

B

95

135

C

140

210

D

190

280

E

75

135

$\sum p_0 = 600$

$\sum q_1 = 900$



$$I_{01} = \frac{\sum P_1 \times W}{\sum P_0 \times W}$$

$$\Rightarrow \frac{90}{100} \times 100 = 90$$

### Simple Average of Price Relative Method

Price Relative  $P = \frac{P_1}{P_0} \times 100$

Quantity Relative  $Q = \frac{Q_1}{Q_0} \times 100$

Price Index Number

Quantity Index Number

(i)  $I_{01} = \frac{\sum P}{n}$

$Q_{01} = \frac{\sum Q}{n}$

(ii) Using Arithmetic Mean

$I_{01} = A.L \left( \frac{\sum \log P}{n} \right)$        $Q_{01} = A.L \left( \frac{\sum \log Q}{n} \right)$

# From the following data construct index numbers for 2004 taking 2002 as base year

Milk	₹ 3 / Litre	4 / Litre
Cloth	₹ 40 / Metre	45 / Metre
Potatoes	₹ 8 / kg	5 kg
Wheat	₹ 50 / Quintal	55 Quintal



	B	P <sub>1</sub>	$P = \frac{P_1}{P_0} \times 100$	Log P
MILK	3	4	$\frac{4}{3} \times 100 = 133.33$	2.1249
CLON	40	45	$\frac{45}{40} \times 100 = 112.50$	2.0512
potatoes	4	5	$\frac{5}{4} \times 100 = 125.00$	2.0969
wheat	500	550	$\frac{550}{500} \times 100 = 110.00$	2.0414
			$\Sigma P = 480.83$	$\Sigma \log P = 8.3144$

using AM

$$P_{01} = \frac{\Sigma P}{N} = \frac{480.83}{4} = 120.2075$$

using GM

$$P_{01} = A.L. \left( \frac{\Sigma \log P}{N} \right) = A.L. \left( \frac{8.3144}{4} \right)$$

$$A.L. (2.0786) = 119.90$$

Weighted Index number

Weighted Aggregate method

Weighted Average of Price Relative method

- (i) Laspeyres's method
- (ii) Paasche's method
- (iii) Fisher's ideal index number

Laspeyres's method :-

This formula was developed by Laspeyres in 1871.

Price Index number

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

Quantity Index number

$$Q_{01} = \frac{\Sigma Q_1 P_0}{\Sigma Q_0 P_0} \times 100$$



2. Paasche's Method

Price index number

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

Quantity index number

$$Q_{01} = \frac{\sum Q_1 P_1}{\sum Q_0 P_1} \times 100$$

3. Fisher's Ideal Index Number

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

$$Q_{01} = \sqrt{I \times P} = \sqrt{\frac{\sum Q_1 P_0}{\sum Q_0 P_0} \times \frac{\sum Q_1 P_1}{\sum Q_0 P_1}} \times 100$$

Commodity	$P_0$	$Q_0$	$P_1$	$Q_1$	$P_0 Q_0$	$P_1 Q_0$	$P_0 Q_1$	$P_1 Q_1$
A	3	7	4	5	21	28	20	15
B	4	12	6	8	48	72	48	32
C	6	10	5	15	60	50	75	45
D	3	15	2	18	45	30	36	54
					$\sum P_0 Q_0 = 174$	$\sum P_1 Q_0 = 150$	$\sum P_0 Q_1 = 179$	$\sum P_1 Q_1 = 146$

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

$$= \sqrt{\frac{150}{174} \times \frac{146}{179}} \times 100$$

$$= \sqrt{\frac{32220}{33254}} \times 100$$

$$= 98.46 \times 100 = 9846$$