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 the 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 measures the changes
3. Index number study variable or group of related variables.

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Types of Index numbers

- Price Index
- Quantity Index
- value Index ($p \times q$)

(a) Wholesale Price Index numbers
(b) Retail Price Index numbers

(a) consumption
(b) production
(c) agricultural
(d) industrial

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

1) Unweighted Index Number → unweighted Index numbers are supposed to include the items which are of equal importance.

(a) Simple Aggregative Method
(b) Simple Average of Price Relatives Method

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2 Weighted Index Numbers :- (a) Weighted Aggregative Method.
(b) Weighted Average of Price Relatives Method

Index Numbers

- Simple/unweighted Index numbers
  - Simple Aggregative Method
  - Simple Average of Price Relative Method
- Weighted Index Numbers
  - Weighted Aggregative Method
  - Weighted Average of Price Relative Method

Simple Aggregative Method

Price Index Numbers

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

Quantity Index Numbers

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

1) From the following data construct in an Index number for 2009 taking 2003 as base

Commodities	Price in 2003 (p_0)	Price in 2009 (p_1)
A	100	140
B	95	135
C	140	210
D	190	280
E	75	135
	$\Sigma p_0 = 600$	$\Sigma p_1 = 900$

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

$\Rightarrow \frac{90}{60} \times 100 = 150$

Simple Average of Price Relative Method

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

Quantity Relatives $Q = \frac{q_1}{q_0} \times 100$

Price Index Numbers

(i) $P_{01} = \frac{\sum P}{N}$

Quantity Index Numbers

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

(ii) Using Geometric Mean

$P_{01} = A.L\left(\frac{\sum \log P}{N}\right)$ $\quad Q_{01} = A.L\left(\frac{\sum \log Q}{N}\right)$

From the following data construct Index Numbers for 2004 taking 2002 as base year

Milk	8.3/litre	4/litre
Cloth	140/metre	45/metre
Potatoes	3	1/kg
Wheat	2.5	55 quintal

	P_0	P_1	$P = \frac{P_1}{P_0} \times 100$	$\log P$
Milk	3	4	$\frac{4}{3} \times 100 = 133.33$	2.1249
Cloth	40	45	$\frac{45}{40} \times 100 = 112.50$	2.0512
potato	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 A.M

$$P_{01} = \frac{\Sigma P}{N} = \frac{480.83}{4} = 120.20$$

using G.M

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

$$A.L(2.07861) = 119.9$$

Weighted Index Number

Weighted Aggregate Method

Weighted Average of Price Relative Method

(i) Laspeyre's Method
(ii) Paasche's Method
(iii) Fisher's ideal Index Number

Laspeyre's Method :- This formula was developed by Laspreyre's 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. Fisher's Method

Price index numbers

$$P_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$$

Quantity / Volume index numbers

$$Q_{01} = \frac{\Sigma q_1 p_1}{\Sigma q_0 p_1} \times 100$$

3. Fisher's ideal index numbers

$$P_{01} = \sqrt{L \times P} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100$$

$$Q_{01} = \sqrt{P \times P} = \sqrt{\frac{\Sigma q_1 p_0}{\Sigma q_0 p_0} \times \frac{\Sigma q_1 p_1}{\Sigma q_0 p_1}} \times 100$$

Commodity	p_0	q_0	p_1	q_1	$p_0 q_0$	$p_1 q_0$	$p_1 q_1$	$p_0 q_1$
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	90
D	3	15	2	18	45	30	36	54
					$\Sigma p_0 q_0$ = 174	$\Sigma p_1 q_0$ = 180	$\Sigma p_1 q_1$ = 179	$\Sigma p_0 q_1$ = 191

$$P_{01} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100$$

$$\sqrt{\frac{180}{174} \times \frac{179}{191}} \times 100$$

$$\sqrt{\frac{32220}{33234}} \times 100$$

$$0.9846 \times 100 = 98.46$$