

CH :- Index Numbers

(V.V.V. easy)

- Index number is a **statistical measure** designed for measuring **changes** in a variable or group of related variables with respect to time, location or other characteristics.
- Index numbers are expressed in terms of **percentage**
- Index numbers are relative or **comparative measure** - **ment** of group of items
- Index numbers are called Specialised type of averages

→ Types of Index Numbers (3 Marks)

(i) Wholesale Price Index (WPI)

- It is used to measure general price level when we are required to obtain the wholesale prices of industrial, agricultural and other products from wholesale market

(ii) Consumer Price Index (CPI)

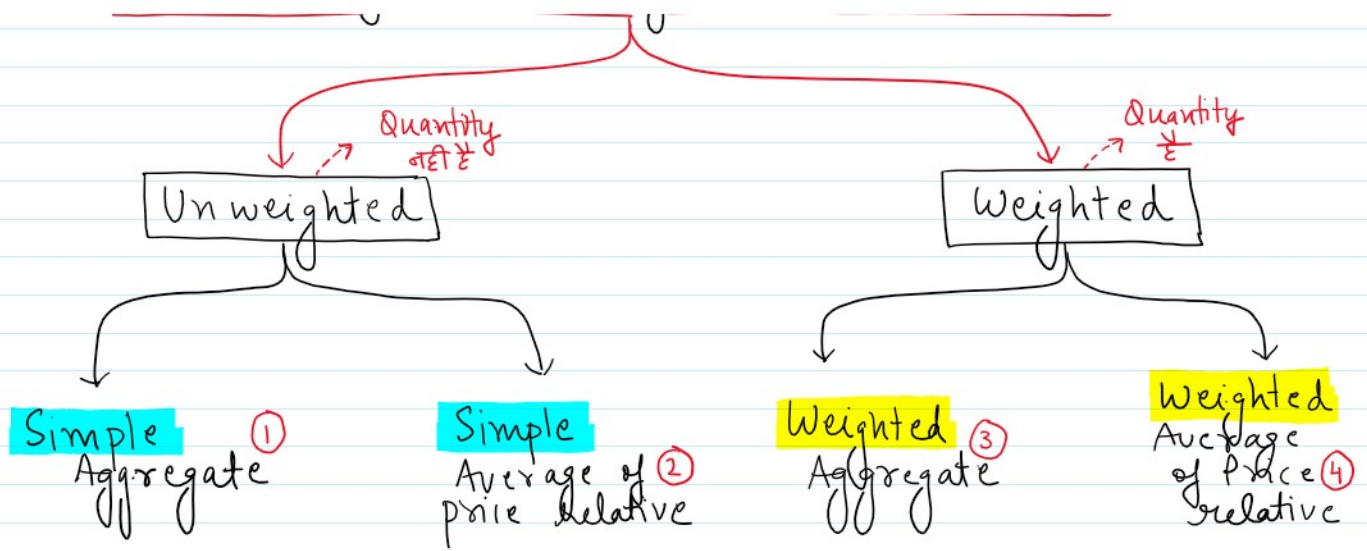
- It is used to measure the change in cost of living where we are required to obtain the retail prices of consumer goods + services from Retail market.

(iii) Industrial Production (Index of Industrial Production - IIP)

- It is used to measure the relative increase or decrease in the level of Industrial production, where we are required to obtain data relating to production of different industries.



* Methods of Constructing Index Numbers *



I Simple Aggregate

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

Price Index
One on Zero

P_1 = Prices of Current period
 P_0 = Prices of Base period

0 → Base period
1 → Current period

II Simple Average of Price Relatives

$$P_{01} = \frac{\sum \left(\frac{P_1}{P_0} \times 100 \right)}{N}$$

Here N = Number of items

eg ①

Items	Prices (Year 2002)	Prices (Year 2022)	Price Relative $\frac{P_1}{P_0} \times 100$
Burger	₹ 2	₹ 40	2000
Momos	₹ 1	₹ 50	5000
Pizza	₹ 5	₹ 100	2000
Spring	₹ 2	₹ 60	2000

Pizza	₹ 5	₹ 100	2000
Spring Roll	₹ 3	₹ 60	2000
	$\sum P_0 = ₹ 11$	$\sum P_1 = 250$	11000

Sol:- (i) Simple Aggregate

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

$$= \frac{₹ 250}{₹ 11} \times 100$$

$$= \boxed{2272.72} \text{ (approx)}$$

(ii) Simple Average of Price Relative

$$P_{01} = \frac{\sum \left(\frac{P_1}{P_0} \times 100 \right)}{N}$$

$$= \frac{11000}{4} = \boxed{2750}$$

eg (2)

Items	P_0	P_1	Price Relative $\left(\frac{P_1}{P_0} \times 100 \right)$
A	10	30	300
B	15	45	300
C	5	60	1200
D	25	125	500
E	30	60	200
	85	320	2500

Sol:- P_{01} (simple aggregate) = $\frac{\sum P_1}{\sum P_0} \times 100 = \frac{320}{85} \times 100 = \boxed{376.4}$

P_{01} (Simple Average of price relative)

$$= \frac{\sum \left(\frac{P_1}{P_0} \times 100 \right)}{N} = \frac{2500}{5} = \boxed{500}$$

III

* Weighted Aggregate *

$$= \sqrt{586.66 \times 578.82}$$

$$= \sqrt{3,39,572.61}$$

$$= 582.73$$

IV

Weighted Average of Price Relatives

$$P_{01} = \frac{\sum \left[\left(\frac{P_1}{P_0} \times 100 \right) \times (P_0 Q_0) \right]}{\sum P_0 Q_0} \quad \text{or} \quad \frac{\sum PV}{\sum V}$$

eg :-

Items	Weights	P_0	P_1	$\frac{P_1}{P_0} \times 100$	$P_0 Q_0$ (V)	PV
A	20	20	35	175	400	70,000
B	12	15	18	120	180	21,600
C	8	10	11	110	80	8,800
D	4	5	5	100	20	2,000
E	6	4	5	125	24	3,000
				630	704	105,400

Sol:-

Step ① :- $\frac{P_1}{P_0} \times 100$

Step ② :- $P_0 Q_0$ = Value weights (V)

Step ③ :- Step ① \times Step ②

$$P \times V = PV$$

$$P_{01} = \frac{\sum PV}{\sum V} = \frac{105,400}{704} = 149.71$$

* Other Important Points *

$$\textcircled{1} \text{ Value Index } (V_{01}) = \frac{\sum P_1 Q_1}{\sum P_0 Q_0} \times 100$$

② Consumer Price Index (CPI)

- Family Budget method (Weighted Relative)
- Aggregate expenditure method

eg :-

Items	A	B	C	D	E
Weights	35%	10%	20%	15%	20%
P_0	1400	200	500	200	250
P_1	1500	250	750	300	400

find CPI

Sol:-

Family Budget Method

Items	Weights ^[W]	P_0	P_1	Price Relative ^[R]	Weighted Relatives ^[WR]
A	35	1400	1500	107.14	3749.9
B	10	200	250	125	1250
C	20	500	750	150	3000
D	15	200	300	150	2250
E	20	250	400	160	3200
ΣW = 100					ΣWR = 13449.9

$$\text{CPI} = \frac{\sum WR}{\sum W} = \frac{13449.9}{100} = 134.49$$

(ii) Aggregate expenditure method

Items	Weights (Q_0)	P_0	P_1	$P_0 Q_0$	$P_1 Q_0$
A	35	1400	1500	49000	52500
B	10	200	250	2000	2500
C	20	500	750	10000	15000
D	15	200	300	3000	4500
E	20	250	400	5000	8000

D	15	200	300	3000	4,500
E	20	250	400	5000	8,000
				69,000	82,500

$$\text{CPI} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100 = \frac{82,500}{69,000} \times 100 = 119.56$$

(Laspeyres's Method)

③ Index of Industrial Production (IIP)

$$\text{IIP} = \frac{\sum \left(\frac{Q_1}{Q_0} \right) W}{\sum W}$$

eg*

Industry	Production (units)		
	Weights	2000	2020
A	20	120	160
B	25	80	110
C	15	70	90
D	25	80	70
E	15	90	120

Find IIP

Sol:-

Items	2000 (Q_0)	2020 (Q_1)	W	$\frac{Q_1}{Q_0} \times 100$	RW
A	120	160	20	133.33	2666.66
B	80	110	25	137.5	3437.5
C	70	90	15	128.5	1928.5
D	80	70	25	87.5	2187.5
E	90	120	15	133.3	2000
			$\sum W = 100$		<u>12220.2</u>

$$\text{IIP} = \frac{\sum RW}{\sum W} = \frac{12220.2}{100}$$

$$\frac{\sum W}{100} = 122.2$$

④ General Uses of Index Number.

- Index numbers are used as "economic" barometer.
- Index numbers are used in comparative measurements.
- Index numbers are used in formulating policies.
- Index numbers are used to identify trends.

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