Index Numbers

Date No.

- An index number is a ratio of two or more time periods are involved, one of which is base time period. The value at the base time period serves as the standard point of comparison.
- The simple index is computed for one variable whereas the composite from two or more variables. Most are composite in nature.
- Relative measure., Unit price measure, comparative measure.
- Barometer of economic development.
- Arithmetic Mean - widely used because of its simplicity
  Geometric Mean - Ideal average for Index Numbers.
- Base Year should be NORMAL i.e. free from natural calamities.

1. **Simple aggregative index** = $P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$

2. **Weighted aggregative method** $P_{01} = \frac{\Sigma P_1 W}{\Sigma P_0 W} \times 100$

Laspeyre's Index = $\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times 100$ **Paasche's Index no.** = $\frac{\Sigma P_1 q_1}{\Sigma P_0 q_1} \times 100$

Fisher's Index no. = $\sqrt{\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}} \times 100$; $I_F = \sqrt{I_L \times I_P}$

Dorbish Bowley = $I_{DB} = \frac{I_L + I_P}{2} = \frac{\left(\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} + \frac{\Sigma P_1 q_1}{\Sigma P_0 q_1}\right)}{2} \times 100$

Marshall Edgworth = $I_{ME} = \frac{\Sigma P_1 (q_0 + q_1)}{\Sigma P_0 (q_0 + q_1)} \times 100 = \frac{\Sigma P_1 q_0 + \Sigma P_1 q_1}{\Sigma P_0 q_0 + \Sigma P_0 q_1} \times 100$

Kelly's Index no. = $I_K = \frac{\Sigma P_1 q}{\Sigma P_0 q} \times 100$; $q = \frac{q_0 + q_1}{2}$

Walsch's Index no. = $I_W = \frac{\Sigma P_1 \sqrt{q_0 q_1}}{\Sigma P_1 \sqrt{q_0 q_1}} \times 100$

Price Relative = $\frac{P_1}{P_0} \times 100$ **Quantity Relative** = $\frac{q_1}{q_0}$

Value Relative = $\frac{V_1}{V_0} = \frac{P_1 q_1}{P_0 q_0}$ Value = Price x Quantity

- If Price increase by K% then, $I = 100 + K$
- If Price increased to K% then, $I = K$
- If Price become K times then, $I = 100K$
- If Price increased by K times, $I = 100K + 100$

Arithmetic mean of Price Index = $\frac{\Sigma I}{n}$

Weighted Arithmetic mean = $\frac{\Sigma IW}{\Sigma W}$

Geometric mean of Price Relative = $\sqrt[n]{I_1 \times I_2 \times I_3 \times \dots \times I_n}$

- Cost of living Index Number / Consumer Price Index Number / CPI
  Family Budget Method = $\frac{\Sigma IW}{\Sigma W}$ Aggregate / Total Exp. method = $\frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times 100$
- Current Year Fixed Base Index no. = $\frac{\text{Current Year Price}}{\text{Base Year Price}} \times 100$
- C.Y. Chain base Index no. / Link Index / Link relative = $\frac{\text{Current Year Price}}{\text{Preceeding Year Price}} \times 100$
- Conversion of Fixed Base Index into Chain Base Index
  C.Y. C.B.I = $\frac{\text{C.Y. F.B.I}}{\text{P.Y. F.B.I}} \times 100$ for 1st year, C.B.I = 100
- Conversion of Chain Base indices into Fixed Base indices
  C.Y. F.B.I = $\frac{\text{C.Y. C.B.I} \times \text{P.Y. F.B.I}}{100}$ for 1st year, C.Y F.B.I = C.Y. C.B.I
- Chain Index = $\frac{\text{C.Y. Link index} \times \text{P.Y. chain index}}{100}$ for 1st yr, Chain = Link
- Base shifting Index = $\frac{\text{old index of current year}}{\text{old index of the yr. to which base is to be shifted}} \times 100$
- Real wages = $\frac{\text{wages in C.Y.}}{\text{C.O.L.I of C.Y}} \times 100$ • Deflated value = $\frac{\text{value in C.Y.}}{\text{C.Y. C.O.L.I}} \times 100$

TESTS: Unit Test : satisfied by - all, not satisfied by - simple aggregative method
Time reversal Test : $P_{01} \times P_{10} = 1$ ← condition
satisfied by : simple aggre, Fisher, Marshal, kelly, washi G.M simple & weighted
not satisfied by : Paashe, Laspeyer, Bowley, A.M
Factor reversal Test = $P_{01} \times q_{01} = V_{01}$ satisfied by only Fisher's formula
Circular Test → extension of Time reversal test
satisfied by : simple aggre, simple GM, weighted AM with fixed weight (kelly)