* Conversion of chain index into Fixed index.

The steps to convert chain Base Index (CBI) into Fixed Base Index (FBI) is

(i) The first year is fixed as the chain base index and it will be taken as the base, 100.

(ii) For finding out the indices for other years, the following formula is used.

$$\left.\begin{array}{r}\text{Current year}\\ \text{F.B.I}\end{array}\right\} = \frac{\text{Current Year's C.B.I} \times \text{Previous Year FBI}}{100}$$

* Test of consistency of Index Numbers

(i) Time Reversal Test :

The Index Number reckoned forward should be reciprocal of the one reckoned backward. One of the advantage claimed in favour of Fisher's formula is that it makes the index number reversible. The Time reversal test shows that the following equation hold good.

Symbolically,

$P_{10} \times P_{01} = 1$ (Omitting the factor 100 from each index number).

Fisher's Ideal formula satisfies time reversal test.

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

$$P_{10} = \sqrt{\frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times \frac{\Sigma p_0 q_0}{\Sigma p_1 q_0}}$$

$$\therefore P_{01} \times P_{10} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times \frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times \frac{\Sigma p_0 q_0}{\Sigma p_1 q_0}}$$

$$= \sqrt{1}$$

$$= 1$$

It shows that the time reversal test is satisfied.

(ii) Factor Reversal Test :

Another basic test is that the formula for index number ought to permit interchanging the prices and quantity without giving inconsistent results ie., the two results multiplied together should give the true value ratio. A good index number should satisfy not only the time reversal test, but also the factor reversal test.

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

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

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

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

$$= \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}.$$

Problem

2). Compute Index number, using Fisher's Ideal formula and show that it satisfies time reversal test and factor reversal test.

	Quantity	Base Year Price	Quantity	Current Year Price
A	12	10	15	12
B	15	7	20	5
C	24	5	20	9
D	5	16	5	14

Sol

Computation of Index Number

	q_0	p_0	q_1	p_1	p_1q_0	p_0q_0	p_1q_1	p_0q_1
A	12	10	15	12	144	120	180	150
B	15	7	20	5	75	105	100	140
C	24	5	20	9	216	120	180	100
D	5	16	5	14	70	80	70	80
				Total =	505	425	530	470.

$$P_{01} = \sqrt{\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \frac{\Sigma p_1q_1}{\Sigma p_0q_1}} \times 100$$

$$= \sqrt{\frac{505}{425} \times \frac{530}{470}} \times 100$$

$$= \sqrt{1.340} \times 100$$

$$= 115.8 .$$

(i) Time Reversal Test :

$$P_{10} = \sqrt{\frac{\Sigma p_0q_1}{\Sigma p_1q_1} \times \frac{\Sigma p_0q_0}{\Sigma p_1q_0}}$$

$$= \sqrt{\frac{470}{530} \times \frac{425}{505}}$$

$$\therefore P_{01} \times P_{10} = \sqrt{\frac{505}{425} \times \frac{530}{470} \times \frac{470}{530} \times \frac{425}{505}}$$

$$= \sqrt{1}$$

$$= 1.$$

(ii) Factor Reversal Test :

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

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

$$\therefore P_{01} \times Q_{01} = \sqrt{\frac{505}{425} \times \frac{530}{470} \times \frac{470}{425} \times \frac{530}{505}}$$

$$= \frac{530}{425} \quad \text{i.e.,} \quad \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}.$$

$$\therefore P_{01} \times Q_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}.$$

Hence the given data satisfies the time reversal test and factor reversal test.

* Method of constructing Consumer Price Index.

There are two methods. They are

(i) Aggregate Expenditure method

(ii) Family Budget Method.

(i) Aggregate Method :

This method is based upon the Laspeyre's method. It is widely used. The quantities of commodities consumed by a particular group in the base year are the weight. The formula is

$$\text{Consumer Price Index Number} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100.$$

Precautions in the use of cost of Living index number:

1) Cost of living index numbers only measure changes in retail price from one period to another period. It does not tell us anything about variations in the living standard at different places.

2) Weights may not be representative and if it is so index numbers would give misleading conclusions.

3) The index numbers do not take into account the changes in qualities.

(ii) **Family Budget Method:**

Here an aggregate expenditure of an average family on various items is estimated and it is value weighted. The formula is

$$\text{Consumer Price Index} = \frac{\Sigma PV}{\Sigma V}$$

where $P = \frac{P_1}{P_0} \times 100$ for each item and

V = Value weight i.e., $p_0 q_0$.

Problem

3) Calculate index number of prices for 1996 on the basis of 1995 from the data given below.

Commodity	Weights	Price per unit 1979	Price per unit 1989.
A	40	16.00	20.00
B	25	40.00	60.00
C	5	0.50	0.50
D	20	5.12	6.25
E	10	2.00	1.50

Sol

	Weights V	p_0	p_1	Price Relatives $P = \frac{p_1}{p_0} \times 100$	PV
A	40	16.00	20.00	$\frac{20}{16} \times 100 = 125$	5000
B	25	40.00	60.00	$60/40 \times 100 = 150$	3750
C	5	0.50	0.50	$0.50/0.50 = 100$	500
D	20	5.12	6.25	$6.25/5.12 \times 100 = 122.1$	2442
E	10	2.00	1.50	$1.50/2.00 \times 100 = 75$	750

$\Sigma PV = 12,442.$

Index number of prices for 1996

$$= \frac{\Sigma PV}{\Sigma V}$$

$$= \frac{12442}{100}$$

$$= 124.42$$

Price Index Number for 1996 = Rs 124.42.