14. Consumer Price Index

As we have studied earlier, price index number is the measure of relative changes in the prices of some commodity over a period of time. In practice these indices are used for various different purposes. One very important use of the theory of index number is in obtaining consumer price index or alternatively also called cost of living index number.

It is a well known fact that the prices of the commodities required for day to day living go on increasing, e.g. prices of food items like wheat, rice, oil etc. are different in different years. This increase (or decrease, if there is any) in prices of commodities directly hit the purchasing power of consumer. A consumer price index is, therefore, devised to measure the over all changes in the purchasing power of the consumer.

A **consumer price index** or cost of living index, is a measure which indicates the relative changes in the prices of a group of items, necessary for the living for a selected group of consumers. In a way, it tells us about what should be the increase in the wages of consumer so that they are able to maintain some standard of living in two time periods. For this purpose, the total expenditure of a household are categorized like food, clothing, rent, electricity, entertainment, education, medicines, miscellaneous etc.

Consumer Price Index number or Cost of living index number measures the effect of changes in the prices of the described basket of goods and services on the purchasing power of a particular class of people during current period as compared with some base period. Change in the cost of living of an individual between two periods means the change in his money income, which will be necessary for him to maintain the same standard of living in both periods. There the cost of living index numbers are intended to measure the average increase in the cost of maintaining the same standard in a given year as in the base year.

15. Construction of Consumer Price Index Number

Thus the consumer price index numbers, also known as cost of living index numbers are generally intended to represent average change over time in the prices paid by the ultimate consumer of a specified group, goods and services. The need for constructing consumer price indices arises because the general index numbers fail to give an exact idea of effect of the change in the general price level on the cost of living of different classes of people, since a given change in the level of prices aces affects different classes of people in different manners. Different classes of people consume different types of commodities and even the same types of commodities are not consumed in the same proportion by different classes of people. For example, the consumption pattern of rich, poor and middle class people varies widely. Not only this, the consumption habits of the people of the same class differ from place to place. For example, the mode of expenses true of a lower division clerk living in Delhi, may differ widely from that of another clerk of the same category living in, say, Mumbai. The consumer price index helps us in determining the effect of rise and fall in prices on different classes of consumers living in different areas, The construction of such an index is of great significance because very often the demand for a higher wage is based on the cost of living index and the wages and salaries in most countries are adjusted in accordance with the consumer price index.

It should be carefully noted that the cost of living index does not measure the actual cost of living nor the fluctuations in the cost of living due to causes other than the change in the price level; its object is to find out how much the consumers of a particular class have to pay more for a certain basket full of goods and services in a given period compared to the base period. To bring out clearly this fact, the Sixth International Conference of Labor Statisticians recommended that the term ‘cost of living index’ should be replaced in appropriate circumstances by the terms ‘price of living index’, ‘cost of living price index’ or ‘consumer price index’. At present, the three terms, namely, cost of living index, consumer price index and retail price index are in use in different countries with practically no difference in their connotation.

It should be clearly understood at the very outset that two different indices representing two different geographical areas cannot be used to compare actual living costs of the two areas. A higher index for one area than for another with the same period is no indication that living costs are higher in the one than in the other. All it means is that as compared with the base periods, prices have raised more in one area than in another. But actual costs depend not only on the rise in prices as compared with the base period, but also on the actual cost of living for the base period which will vary for different regions and for different classes of population.

16. Computation of Consumer Price Index No.

For computing consumer Price Index no. or cost of living index no. we need to have prices and quantity consumed for different categories of items in base a year and current year.

Let p_{oj} = Price of jth commodity in 0 year (base year)

p_{ij} = Price of jth commodity in I year (current year).

q_{oj} = Quantity consumed for j th commodity in 0 year (base year)

Now, consumer Price Index no. is derived as the weighted average of the price relatives, the weight being the values of the quantities consumed in the base year.

Price relative

$$P_j = \frac{p_{ij}}{p_{oj}} \times 100$$

And Weight

$$W_j = p_{oj} \cdot q_{oi}$$

Then,

Consumer Price Index

$$= \sum_j \frac{W_j P_j}{\sum_j W_j}$$

Construct the cost of living index for the year 1982 (Base 1980 = 100).

Item	Unit	Price (1981)	Price (1983)	Weight
A	kg./	0.50	0.75	10%
B	Litre	0.60	0.75	25%
C	Dozen	2.00	2.40	20%
D	kg.	0.80	1.00	40%
E	One pair	8.00	10.00	5%

The consumer price index is obtained by the method of weighted price relatives.

COMPUTATION OF COST OF LIVING INDEX NUMBER

Item	Price in Rupees		Price Relatives (base 1980)	Weight W	PW
	1981 (P_o)	1983 (P_1)	$P = 100 \times \frac{P_1}{P_o}$		
A	0.50	0.75	$100 \times \frac{0.75}{0.50} = 150$	10	1,500
B	0.60	0.75	$100 \times \frac{0.75}{0.60} = 125$	25	3,125
C	2.00	2.40	$100 \times \frac{2.40}{2.00} = 120$	20	2,400
D	0.80	1.00	$100 \times \frac{1.00}{0.80} = 125$	40	5,000
E	8.00	10.00	$100 \times \frac{10.00}{8.00} = 125$	5	625
Total				100	12,650

$$\text{Cost of Living Index} = \frac{\sum PW}{\sum W} = \frac{12,650}{100} = 126.5$$

17. Steps in construction of Consume Price Index.

The main steps which are required for construction of CPI are described below.

(l) Decision about the class of people for whom the index is meant. It is absolutely essential to decide clearly the class of people for whom the index is meant i.e. whether it relates to industrial workers, teachers, officers, etc. The scope of the index must be clearly defined. For example, when we talk to teachers, we are referring to primary teachers, middle class teachers, etc. or to all the teachers taken together. Along with the class of people it is also necessary to decide the geographical area covered by the index.

(2) Conducting, family budget enquiry. Once the scope of the index is clearly defined the next step is to conduct a family budget enquiry covering the population group for whom the index is to be designed. The object of conducting a family budget enquiry is to determine the-amount that an average family of the

group, included in the index spends on different items of consumption. While conducting such an enquiry, the quantities of commodities consumed and their prices are taken into account. The consumption pattern can thus be easily ascertained. It is necessary that the family budget enquiry amongst the class of people to whom the index series is applicable should be conducted during the base period. The Sixth International Conference of Labour Statisticians held in Geneva suggested that the period of enquiry of the family budgets and the base periods should be identical as far as possible.

The enquiry is conducted on a random basis. By applying lottery method some families are selected from the total number and their family budgets are scrutinized in detail.

(3) Deciding on the items. The items on which the money is spent are classified into certain well–accepted groups. One of the choicest and most frequently used classification is –

(i) Food

(ii) Clothing

(iii) Fuel and lighting

(iv) House Rent

(v) Miscellaneous

Each of these groups is further divided into sub–groups. For example, the broad group 'food' may be divided into wheat, rice, pulses, sugar etc. The commodities included are those which are generally consumed by people for whom the index is meant. Through family budget enquiry an average budget is prepared which is the standard budget for that class of people. While constructing the index only such commodities should be included as are not subject to wide variations in quality or to wide seasonal alterations in supply and for which regular and comparable quotations of prices can be obtained.

(4) Obtaining price quotations. The collection of retail prices is very important and at the same time, very tedious and difficult task also. That is because such prices may vary from place to place, shop to shop and person to person. Price quotations should be obtained from the localities in which the class of people concerned reside or from where they usually make their purchases. Some of the principles recommended to be observed in the collection of retail price data required for purposes of construction of cost of living indices are described below:

(a) The retail prices should relate to a fixed list of items and for each item., the quality should be fixed by means of suitable specifications.

(b) Retail prices should be those actually charged to consumers for cash sales.

(c) Discount should be taken into account if it is automatically given to all customers.

(d) In a period of price control or rationing, where illegal prices are charged openly, such prices should be taken into account along with the controlled prices.

The most difficult problem in practice is to follow principle (a) i.e., the problem of keeping the weights assigned and qualities of the basket of goods and services constant with a view to ensuring that only the effect of price change is measured. To confirm to uniform qualities, the accepted method is to draw up detailed descriptions or specifications of the items priced for the use of persons furnishing or collecting the price quotations.

Since prices form the most important component of cost of living indices, considerable attention has to be paid to the methods of price collection and to the price collection personnel. Prices are collected usually by special agents or through mailed questionnaire or in some cases through published price lists. The greatest reliance can be placed on the price collection through special agents as they visit the selected retail out-lots and collect the prices from them. However, these agents should be properly selected and trained and should be given a manual of instructions as well as manual of specifications of items to be priced. Appropriate methods of price verification should be followed such as 'check pricing' in which price quotations are verified by means of duplicate prices obtained by different agents or purchase checking in. which actual purchases of goods are made.

(5) Working on CPI. After quotations have been collected from all retail outlets an average price for each of the items included in the index has to be worked out. Such averages are first calculated for the base period of the index and later every month if the index is maintained on a monthly basis. The method of averaging the quotations should be such as-to yield unbiased estimates of average prices as being paid by the group as a whole. This of course, will depend upon the method of selection of retail outlets and also the scope of the index.

In order to convert the prices into index numbers the prices or their relatives must be weighted. The need for weighting arises because the relative importance of various items for different classes of people is not the same. For this reason, the cost of living index is always a weighted index. While conducting the family budget enquiry the amount spent on each commodity by an average family is decided and these constitute the weights. Percentages of expenditure on the different items constitute the individual weights, allocated to the corresponding price relative and the percentage expenditure on the five groups constitute the group weight.

18. Uses and limitations of consumer price index

(1) These indices are compiled for different groups or classes of people (such as low income, middle income, clerical, labor class, etc.) and are useful to assess the general price movement of the commodities consumed by them.

(2) Cost of living index numbers indicate whether the real wages are

raising or falling, money wages remaining unchanged. In other words they are used for the calculation of real wages and for determining the change in the purchasing power of the money.

(3) Cost of living indices are used for the regulation of dearness allowance or the grant of bonus to the workers so as to enable them to meet the increased cost of living.

(4) These indices are also used for deflation of income and value series in national accounts.

(5) By itself, cost of living index number does not throw much light on the inflationary or deflationary trend on the soundness of an economy but in conjunction with other tools such as the indices of wholesale prices, wages, profits, production, employment etc., it serves as an economic indicator for the analysis of price situation.

19. Base Shifting of Index Numbers.

Base shifting means the changing of the given base period (year) of a series of index numbers and recasting them into a new series based on some recent new base period. This step is quite often necessary under the following situations :

(i) When the base year is too old or too distant from the current period to make meaningful and valid comparisons.

(ii) If we want to compare series of index numbers with different base periods, to make quick and valid comparisons both the series must be expressed with a common base period.

Base shifting requires the recompilation of the entire series of the index numbers with the new base. However, this is a very difficult and time consuming job. A relatively much simple, though approximate method consists in taking the index number of the new base year as 100 and then expressing the given series of index numbers as a percentage of the index number of the time period selected as the new base year. Thus, the series of index numbers, recast with a new base is obtained by the formula :

Recast Index No. of any year

$$= \frac{\text{Old Index No. of the year}}{\text{Index No. of new base year}} \times 100$$

$$= \left(\frac{100}{\text{Index No. of new base year}}\right) \times \text{Old Index Number of the year}$$

In other words, the new series of index numbers is obtained on multiplying the old index numbers with a common factor :

$$= \frac{100}{\text{Index No. of New Base Year}}$$

If arithmetic mean or median is used for averaging the price relatives then the usual method of base shifting consists in calculating the price relatives for each individual item w.r.t. the new base and then averaging their totals, i.e., the whole of the series is to be reconstructed. However, in practice, even in these cases the approximate method described above gives result which are fairly close to those obtained otherwise.

20. Splicing Two Index Numbers Series.

In order to obtain continuity in the comparison of two or more overlapping series of index numbers, we combine or splice them into a single continuous series. For example, suppose an index number series 'A' with base period 'a' is discontinued in 'period' 'b' due to certain reasons and a new series 'B' of index numbers is computed with base period 'b' (and the same items). In order to compare the series 'B' with 'A' we splice the series B to A to obtain a continuous series from 'a' onwards. The process is very much alike to that of base shifting and is illustrated below :

SPLICING OF TWO INDEX NUMBER SERIES

Year	**Series I Base 'a'**	**Series II Base 'b'**	**Series II (Base 'a') spliced to series I**	**Series I spliced to series II (Base 'b')**
a	100		100	$\frac{100}{a_k} \times 100$
a+1	a_1		a_1	$\frac{100}{a_k} \times a_1$
a_{+2}	a_2		a_2	$\frac{100}{a_k} \times a_2$
⋮	⋮		⋮	⋮
b–1	a_{k-1}		a_{k-1}	$\frac{100}{a_k} \times a_{k-1}$
b	a_k	100	a_k	100
b+1		b_1	$\frac{a_k}{100} \times b_1$	b_1
b+2		b_2	$\frac{a_k}{100} \times b_2$	b_2
b+3		b_3	$\frac{a_k}{100} \times b_3$	b_3
⋮		⋮	⋮	⋮

Explanation. When series II is spliced to series I to get a continuous series with base 'a'.

100 of II series becomes a_k

=> b_1 of II series becomes $\frac{a_k}{100} \times b_1$,

and b2 of II series becomes $\frac{a_k}{100} \times b_2$, and so on. Thus multiplying each index of the series II with a constant factor $\frac{a_k}{100}$, we get the new series of index numbers spliced to series I (Base 'a'). In this case series I is also said to be spliced forward.

If we splice series I to series II to get a new continuous series with base 'b' then,

a_k of first series becomes 100

=> a_{k-1} of first sereis becomes $\frac{100}{a_k} \times a_{k-1,}$

$\vdots \quad \vdots \quad \vdots \quad \vdots \quad \vdots$

a_2 of first series becomes $\frac{100}{a_k} \times a_2$, and so on.

Thus the new series of index numbers with series I spliced to series II (Base 'b') obtained on multiplying each index of series I by new constant factor ($100/a_k$). In this case we say that series is spliced backward.

Given below are two price index series. Splice them on the base 1974=100. By what per cent did the price of steel rise between 1970 and 1975?

Year	**Old price index for Steel Base (1965=100)**	**New price index for Steel Base (1974=100)**
1970	141.5	
1971	163.7	
1972	158.2	
1973	156.8	99.8
1974	157.1	100.0
1975		102.3

SPLICING OF OLD PRICE INDEX TO NEW PRICE INDEX

Year	**Old price index for Steel Base (1965=100)**	**New price index for Steel Base (1974=100)**
1970	141.5	$\frac{100}{157.1} \times 141.5 = 99.06$
1971	163.7	$\frac{100}{157.1} \times 163.7 = 104.19$
1972	158.2	$\frac{100}{157.1} \times 158.2 = 100.69$
1973	156.8	$\frac{100}{157.1} \times 156.8 = 99.80$
1974	157.1	100.0
1975		102.3

The percentage increase in the price of steel between 1970 and 1975 is

$$\frac{102.30 - 90.06}{90.06} \times 100 = 0.1359 \times 100 = 13.59$$

Hence, the required increase is 13.59%.

21. **Deflating the Index Numbers**

Deflating means "making allowance for the effect of changing price levels". The increase in the prices of consumer goods for a class of people over a period of years means a reduction in the purchasing power for the class. For example the increase in price of a particular commodity from Rs. x in base year 'a' to Rs. 2x in the year 'b' implies that in 'b' a person can buy only half the amount of the commodity with Rs. x which he was spending on it in 'a'. Thus the purchasing power of a rupee in only 50 paise in 'b' as compared to 'a'.

The idea of "the purchasing power of money" or "a measure of the real income" for a class of people is obtained on deflating the wage series by dividing each item by an approximate price index e.g., the cost of living index. The real wages so obtained my be converted into index number if desirable. More precisely,

$$\text{Real wage} = \frac{\text{Money or Nominal Wages}}{\text{Price Index}} \times 100$$

The real income is also known as deflated income. This technique is extensively used to deflate value series or value indices, rupee sales, inventories, income wages and so on.

22. Index of Industrial Production.

The index of industrial production is aimed at reflecting changes (increase or decrease) in the volume of industrial production (i.e., production of non-agricultural commodities) in a given period compared to some base period. These indices measure, at regular intervals, the general movement in the quantum of industrial production. Such indices are useful for studying:

(i) The progress of general industrialization of a country, and

(ii) The effect of tariff on the development of particular industries.

These indices of industrial activity are of great importance in the formulation and implementation of industrial plans. For the construction of the indices of industrial production, the data about production of various industries are usually collected under the following heads:

(i) Textile Industries: Cotton, silk, woolen, etc.

(ii) Metallurgical Industries: Iron and steel, etc.

(iii) Mining Industries: Coal, pig-iron and Ferro-alloys, petrol, kerosene, copper (virgin metal), etc.

(iv) Mechanical Industries: Locomotives, sewing machines, aero-planes, etc.

(v) Industries subject to excise duty: Tea, sugar, cigarettes and tobacco, distilleries and breweries, etc.

(vi) Electricity, gas and steam; Electric lamps, electric fans, electrical apparatus and appliances, etc.

(vii) Miscellaneous: glass, paints and varnish, paper and paper-board, cement chemicals etc.

Usually, the data (figures of output) are obtained for various industries on monthly basis and the indices of industrial production are obtained as the weighted arithmetic mean (or sometimes geometric mean) of the production (quantity) relatives by the formula:

$$I_{oj} = \frac{\sum Q_j W_j}{\sum W_j}$$

Where Q_j = production relative = q_{ij}/q_{oj},

And W_j is the weight assigned to jth them (industry).

The weights may be assigned to various industries on the basis of, say, capital invested, net output, production etc. The concept of 'value added by manufacture' is the most commonly used criterion for determining the weights to be assigned to different industries.