UNIT 5

RBI Handbook- CPI, WPI, Concept of Price Index , Measuring Inflation

The main emphasis of this unit is on price indices. The students should make themselves conversant with the various formulas used in constructing an index number, their applicability, merits and demerits etc from their Statistics textbook. These things are not explained here for obvious reasons. We shall only put emphasis on the application of indices in respect of prices (as used in India).

Introduction

An Index is a measure of the change in a **group of related variables** over **two different situations. Index numbers** are the indicators which reflect changes over a specified period of time in respect of (i) **prices** of different commodities, (ii) industrial production, (iii) imports and exports, (iv) cost of living, etc. These indicators are important tools for review and management of present economic positions and plan formulation. Some of the important indices like **Wholesale Price Index (WPI), Index of Industrial Production (IIP), Consumer Price Index (CPI),** etc. give a fairly good idea as to what is happening in the economy.

Price indices in India

(i)   **WPI**- It is compiled and released on monthly basis by the *Office of Economic Adviser, Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce & Industry;*

(ii)   **CPI (Urban, Rural and All India)**- It is released by *Central Statistics Office (CSO), Ministry of Statistics & Programme Implementation (MoSPI);*

(iii)   **CPI (Industrial Workers)-** CPI (Agricultural Labour) and CPI (Rural Labour) are a set of Indices released by the *Labour Bureau, Ministry of Labour*. **Some States also compile variants of CPI and WPI indices at the State level.**

Uses of WPI

WPI is an important measure to monitor the dynamic movement of prices at the **wholesale level**. In the real world, prices keep on changing. WPI is useful for the following reasons.

- It acts as a **deflator of various nominal macroeconomic variables** including Gross Domestic Product (GDP).
- The WPI based inflation estimates serve as an important determinant, in formulation of **trade, fiscal and other economic policies** by the Government.
- WPI is used for the purpose of **escalation clauses** in the supply of raw materials, machinery and construction work. Business firms in search of effective methods for coping with changes in prices often employ price adjustment (escalation) clauses in long-term sales and purchase contracts.

Need for a periodic revision in the base year of WPI

 Over time economies undergo structural changes. Under the current Indian environment, changes in the economy are taking place at a much faster pace than ever before. Product and their specifications are changing very fast. It has, therefore, become increasingly difficult to obtain the

price information of selected products for a **fixed number of quotations** over a longer period of time. Also, a number of products, which were very important in terms of the market share during the base year of the ongoing series, lose relative importance or become irrelevant and have to be replaced by new substitutes in the market.

Working Group for revision of base year from 2004-05

A Working Group for the revision of the Wholesale Price Index Numbers (Base: 2004-05= 100) was constituted under the Chairmanship of Late Dr Saumitra Chaudhuri, a former member of the then Planning Commission, New Delhi, in March, 2012. The principal **Terms of Reference of the Working Group** were as follows:

- To select the most appropriate Base Year for the preparation of a new official series of Index Numbers of Wholesale Price (WPI), Producers Price Index (PPI) and Business Service Price Index (BSPI) in India.
- To review commodity baskets of the current series of WPI, PPI and BSPI and suggest additions/ deletions of commodities in the light of structural changes in the economy witnessed since 2004-05.
- To evolve a suitable system for allocation of weights to the various commodities to be included in the WPI/ PPI/BSPI basket.
- To decide the computational methodology to be adopted for Monthly WPI/ PPI.

Concept and Methodology

Changes in Definition of Wholesale Price Index- Wholesale price is generally defined to capture all bulk transactions of goods carried out in the domestic market. **WPI,** therefore, tries to capture all possible transactions at first point of bulk sale in the domestic market. However, there are, in practice, many points of bulk sale as follows:

(i)   For **agricultural items**, bulk price refers to the **Mandi** price;
(ii)   For **minerals**, it refers to **ex-mine** prices; and
(iii)   For **petroleum products** it refers to **Refinery Transfer Price** (RTP).
(iv)   For **Manufactured Products**, the effective prices used for compilation is the "basic/list price – rebate/trade discount", thus leaving out any indirect taxes as part of price definition. Excluding indirect taxes from ex-factory prices for manufactured products is in line with international practices and inflation estimates are not influenced by fiscal policy changes. Also, this change would bring WPI closer to the concept of Producer Price Index (PPI), for the Manufactured Products.
(v)   For **Exports and Imports** in the WPI, weights of the item basket are derived by calculating the net traded value by adding the net imports to the domestic production. The only exception to this rule being the **'Crude Oil'** where only domestic value of production was considered as crude is not traded in the domestic market.

Selection of base year- The well-known criteria for the selection of a new base year are:

(i)   a normal year, i.e., a year in which there are no abnormalities in the level of production, trade and in the price level and price variations,
(ii)   a year for which reliable production, price and other required data are available, and

(iii)   a year as recent as possible and comparable with other data series.

The year 2011-12 was assessed to be a normal year from the point of view of agriculture production and commodity prices. The Central Statistical Office (CSO) shifted its National Account Statistics (NAS) base to the new base year of 2011-12. In order to make the WPI series compatible with other important series in terms of a common base to all of them, it was decided that the year 2011-12 would be the new base year for the new WPI series also.

The WPI with the year 2011-12 as the base year

Following the recommendation of the Working Group for the revision of the WPI (Base 2004-05) series, a representative commodity basket comprising **697** items was selected. The weighting structure derived for the new series is consistent with the structure of the economy for the year 2011-12. The number of quotations selected for collecting price data for the above items are **8331.** A comparative statement of weights, number of items and number of quotations between the old series (Base 2004-05 = 100) and new series (Base: 2011-12 =100) is given for the major groups in **table 1.**

Table 1
Comparative Statement of Weights, Number of Items and Number of Quotations between Old and New WPI

Major group	Comparative Weights		No. & Items		No. of Quotations in old and new WPI series	
Year	2011-12	2004-05	2011-12	2004-05	2011-12	2004-05
All Commodities	100.0	100.0	697	676	8331	5482
Primary articles	22.61	20.11	117	102	983	579
Fuel & power	13.15	14. 91	16	19	442	72
Manufactured Products	64.23	64.97	564	555	6906	4831

Method of Calculation of WPI

 The Compilation of new WPI series broadly consists of two stages –
(i) First, the item level indices (i.e. elementary price index) are calculated using **"Jevons Index formula"**, which uses the **Geometric Mean (GM)** of Price Relatives (i.e. the price change). Price relatives are calculated as the percentage ratios, i.e. by dividing the current price by the base period price and multiplying the quotient by 100. These elementary indices are the lowest level of aggregation where prices are combined into price indices.

(ii) In the second stage, these elementary price indices are aggregated using weighted arithmetic mean to obtain higher level (at sub-group/ group/ major group/ All Commodities level) indices using **Laspeyre's index formula**, which has a fixed base-year weighting diagram operative through the entire life span of the series.

The formula used is:

I = Σ (Ii × Wi) / ΣWi

Where, **Σ** represents the summation operation,

I = *Index Number of wholesale prices of a sub-group/group/major group/All commodities*

Wi = *Weight assigned to the i-th item/sub-group/group/major group*

Ii= *Index of the i-th item/sub-group/group/major group*

Rationale for using Jevons Index formula for elementary price index

In the new WPI series, elementary price index (i.e. at the item level) has been computed using the geometric mean of the price relatives (Jevons' Index) as opposed to the practice of taking arithmetic mean of price relatives (Carli Index) as was the case in the previous WPI series. However, in the computation of All-India CPI, geometric mean is used for calculation of elementary index.

In view of the above, for convergence of methods used in similar index compilation by the government, it was decided to use Geometric Mean in new WPI series also. Also, statistically, Jevons' Index is taken to be more robust in comparison to Carli. The **Jevons' Index passes crucial tests such as time reversal and factor reversal tests**.

One criticism of the Carli index is that it gives more weight to price increases than to decreases and thus carries an upward bias, whereas the Jevons' Index gives equal weight to upward and downward movements within the elementary aggregate. Since it is not desirable to allow the item level indices to be swayed by price movements of higher priced items especially when number of quotations is less, Jevons' index seems to be a reasonable choice for computing item level index.

One or two important points to be noted

Seasonal Items

There are a number of agricultural items, especially in the fruits and vegetables group, which are of seasonal nature. When a particular seasonal item disappears from the market and its prices are not quoted, the index of such an item is not compiled and its weight is distributed over the remaining items in the concerned sub-group, on a *pro rata* basis. Reporting period of some of the seasonal fruits and vegetable items has increased based on the availability of price quotations for longer duration.

Linking Factor

In order to maintain continuity in the time series data on wholesale price index, it is imperative to provide a linking factor so that the new series may be compared with the outgoing one. The Office of the Economic Adviser has been using the arithmetic conversion method to link the various prices index series.

Limitations of WPI

Being an economy-wide index, WPI attempts to capture the most important items. Selection of items also depends on the availability of the monthly information (price quotations). **It is natural, therefore, that many commodities and items or sub-items may not find a place in the WPI.**

Provisional WPI is released with a time lag of two weeks of the reference month and is initially provisional. After eight weeks, the index is finalized and final figures are released and then frozen thereafter. Thus, no further changes are incorporated in the index after 10 weeks. Because of this approach, delayed responses from data sources can only be included retrospectively only up to 8 weeks. **Thus, non-response for a particular commodity/item or commodity/group delays the alignment for a considerable period.**

Consumer Price Index (CPI)

Consumer Price Index (CPI) measures the changes over time in the level of **retail prices** of goods and services that a **reference population acquires, use, or pay for consumption** (The population that falls within the scope of an index is termed as the reference population). In practice, a CPI measures the cost of purchasing a fixed basket of goods and services. The coverage and applicability of CPIs are generally limited to specified socio-economic groups.

From the viewpoint of a consumer, inflation affects the purchasing power of his money. Under the assumption of a given utility function for the consumer, the CPI for period t+1 measures how much more or less money he needs to spend in order to be as well off as in period t. As such, the inflation estimates based on CPI are considered more representatives of temporal changes in consumer prices and consumer well-being than those based on WPI.

Uses of CPI

CPI is a current socio-economic indicator that needs to be constructed:

- To measure the changes over time in the general level of prices of consumption goods and services that the reference population acquire, use or pay for consumption.
- To provide one of the basic parameters needed for economic planning and policy formulations by Government as well as private organizations.
- To adjust the taxes, fines or fees levied by Government so as to maintain the burden upon the people paying taxes, fines, etc. constant in real terms.
- For obtaining constant-price estimates of consumption expenditure for national accounting.
- For indexation of wages and salaries in contracts of employment. This presumably avoids the need to renegotiate the contracts when prices rise.
- For indexation of prices in contracts for the supply of goods and services by firms.

Types of CPI constructed in India

There are **four types of CPIs** compiled and released at national level on monthly basis. These are:

- CPI for Industrial Workers (IW),
- CPI for Agricultural Labourers (AL),
- CPI for Rural Labourers (RL), and
- CPI for Urban Non-Manual Employees (UNME).
  The first three are compiled by the Labour Bureau in the Ministry of Labour and Employment, the fourth by the **Central Statistical Organisation (CSO)** in the Ministry of Statistics and Programme Implementation.

CPI and Cost of Living Index (COLI) are related but not the same

The changes in consumer prices affect the real purchasing power of households' money incomes and hence, the standard of living or welfare that they can achieve out of a given money expenditure. An index may aim to measure the effects of price changes on the cost of achieving a constant standard of living (i.e. level of utility or welfare) **(COLI)** as distinct from maintaining the purchasing power to buy a fixed consumption basket of goods and services **(CPI)**. When the prices are rising, it is intended to measure the minimum percentage by which households' incomes and expenditures would need to be increased in order to enable the households to continue to enjoy the same standard of living.

Maintaining a constant standard of living does not imply continuing to consume a fixed basket of goods and services when the prices of different goods and services are changing not uniformly with respect to each other. A COLI allows for the fact that households who seek to maximize their welfare from a given expenditure, can benefit by adjusting their expenditure patterns to take account of changing relative prices by substituting goods that have become relatively cheaper, for goods that have become relatively dearer.

The cost of living of a defined group of consumers, at any point of time, means the cost of the goods and services consumed by an average unit of the group (unit being a household or a family, etc.) to attain a certain level of satisfaction or level of living or level of utility, etc. The basket of goods and services consumed would depend on (a) the price system prevailing at a given point of time, (b) the tastes and preferences of the group at that time and (c) the level of living (or satisfaction) being considered.

It is obvious that the construction of COLI is operationally difficult, involving determination of the current basket of goods and services in terms of current level of satisfaction at every point of time for which an index is compiled. In India, COLI is not compiled. As an approximation to COLI, a fixed basket price index (both the nature and quantity of the constituent items of the basket are to be kept fixed during the life time of an index) i.e. Consumer Price Index (CPI) which only gives the true price changes in the cost of fixed consumption basket, is compiled.

Index Formula

We know about the Laspeyre's index formula, Paasche's index formula and Fisher's **ideal index formula.** Technically, it is true that the Fisher's formula should be used but in most countries, including India, Laspeyre's index formula is used for construction of CPI. In normal economic situations, the Laspeyre's index shows an upward bias (in relation to the true value of the index) with the passage of time but is used mainly due to practical convenience in its compilation as the weights are determined in the base period and they remain constant during the entire life of the index.

Steps in constructing a CPI

There are two essential constituents of a CPI namely, (i) **the weights** and (ii) **retail prices.** The weighting matrix is constructed at the start of the series **usually on the basis of a family budget enquiry** (to determine the consumption pattern) among the reference population group. The weighting matrix along with the base prices of the goods and services constitutes the basic framework on which the index series is compiled periodically. The recurring data necessary for its compilation are the retail prices (of goods and services featuring in the index basket) collected periodically at suitable intervals.

The first thing, therefore, is the conduct of a family budget enquiry. It is thus, necessary to ensure that the family budget enquiry is based on correct sampling techniques. Care has to be taken to ensure that the sampling frame used for drawing the sample is not inaccurate, incomplete, inadequate or out of date.

The family budget enquiries among non-manual employees in the urban areas, working class population in urban as well as semi-urban and rural areas, and rural labourers including agricultural labourers, have to depend on the interview method because of the relatively low standard of literacy among the majority of the population concerned. This necessitates the employment of a large body of field investigators well trained in the techniques of interviewing and eliciting reliable information.

The consumption expenditure data arrived at from a family budget enquiry, are normally in terms of averages for a month. The data are collected for a full year (any continuous twelve-month period) and the monthly averages are worked out therefrom. This is necessary for removal of seasonal effects.

The average budget derived from a family budget enquiry consists of all items of expenditure reported by the families surveyed. These items can be broadly classified as:- **Consumption expenditure** and **Non-consumption expenditure**. It is obvious that only **consumption expenditure** should be considered for the purpose of a weighting matrix for construction of Consumer Price Index series.

Selection of a base year: The well known criteria for the selection of base year are :-
   (i)   a normal year i.e. a year in which there are no abnormalities in the level of production, trade and in the price level and price variations,
   (ii)   a year for which reliable price data are available and
   (iii)   a year as recent as possible, and comparable with other price index series released at national and state levels.

Collection of Price Data

Prices are the retail prices inclusive of all indirect taxes which a consumer has to pay. It is clear that the prices form the most important component of Consumer Price Index Numbers, and hence, great care has to be taken in collecting the prices for any item which could statistically be taken as representative of the entire universe of consumer transactions in respect of that item. This universe involves various varieties of that item purchased from several outlets in different markets at different points of time within the period considered. Thus, the sample price quotations have to be collected through sampling along three dimensions, viz. **(i) over the geographical spread of the region,** (ii) **over time** and (iii) **over the entire varieties of specifications for each commodity.**

Since it is never possible to collect prices of every good from every shop, some sampling techniques must be employed. For selection of shops, usually probability sampling or judgment sampling or a judicious combination of both is employed.

Another dimension on which sampling technique has to be used is **'time'**. The frequency of retail price collection depends on the nature of price variation over time. For standard items, i.e. goods manufactured under patent specifications, etc. the price variations would occur over longer periods and it may not be necessary to collect the prices at intervals shorter than say, a month. In the case of items like house-rent it may be sufficient to take account of changes at even longer intervals say, six months.

Computation

As explained earlier, the index is compiled by using the Laspeyre's base weighted formula because of its inherent practical advantages. The formula in its aggregative form is expressed as below:-

$$[(\Sigma\, Q_0\, P_n)/ (\Sigma\, Q_0\, P_0)] \times 100$$

The operational form of the formula is obtained by adjusting the numerator $(\Sigma\, Q_0\, P_n)$ as $(\Sigma\, Q_0\, P_n) \times (P_n/P_0)$ which is simply an alternative algebraic expression without changing its significance or value, is given as:- $[(\Sigma\, Q_0\, P_n) \times (P_n/P_0) / (\Sigma\, Q_0\, P_0)] \times 100$ where the expression $Q_0\, P_0$ denotes the base-period expenditure on an item, and the expression (P_n/P_0) is called the price relative (PR) which is the ratio of the price of an item in the current period to its price in the base period.