Measurement of Inflation & price Indices in India

Measuring Inflation

- **Inflation** occurs when general level rises continuously.
- General price level is obtained as a weighted average of the individual goods' prices
- $P_t = \sum_{i=1}^{n} w_i P_{it}$
  - P_t= general price in time period t
  - P_{it}=Price of good i at period t
  - w_i= Weight of good i
  - n=no. of goods and services in the economy
  - $w_i \geq 0$
  - $\sum w_i = 1$

General Price level: An Example

Goods	Price in the year 2011 (Rs)	Weight
Wheat	30/kg	0.5
Cloth	400/piece	0.4
Tractor (on rent)	2000/month	0.1

General price Level in 2011 = 0.5(30)+0.4(400)+0.1(2000)=375

Cont….

- The weight for a particular component item can be derived by the relative significance of that item in all the items during the base year:

$$W_i = \frac{Q_{i0}P_{i0}}{\sum_i Q_{i0}P_{i0}} \qquad (1)$$

Q_{i0} =Quantity of commodity i in the base year

P_{i0}= Price of commodity i in the base year

- General price level in itself is meaningless.
- Its carries significance in the computation of inflation rate, which is better approached through a price index.
- Price index expresses the current price in relation to its value in the base year.
- The price index in period t can be defined as $PI_t = \frac{P_t}{P_0}$ (2)
- If the price of a product in the base year 2011 was 120 and in the 2016, it becomes 200, the price index for the year 2016 will be 200/120=1.67
- This indicates that the price of the product has increased by 67%.

Cont….

- Equation (2) is better for the price of an individual good. For general price, which is a weighted average of various prices, the price index can be computed as

$$PI_t = \sum W_i \left[\frac{P_{it}}{P_{i0}}\right]$$

Substituting for W_i from eq (1)

$$PI = \left[\frac{Q_{i0}P_{i0}}{\sum_i Q_{i0}P_{i0}}\right]\left[\frac{P_{it}}{P_{i0}}\right]$$

Solution of this will give

$$PI_L = \left[\frac{\sum Q_{i0}P_{it}}{\sum Q_{i0}P_{i0}}\right] \qquad (3)$$

(Since weighing pattern has been suggested by Laspeyre, it is called Laspeyre's index)

Alternatively, Paasche's index can be estimated as

$$PI_p = \left[\frac{\sum Q_{it}P_{it}}{\sum Q_{it}P_{i0}}\right] \qquad (4)$$

- Laspeyre's index takes base year quantities, while Paasche's index takes current year quantities.

Comparison between two indices

- Laspeyre's index measures changes in the cost of the fixed basket of goods from a base year.
- It assumes no substitution due to relative price changes
- It usually overestimates price index.
- Paasche's index assigns weights by current consumption pattern
- It tends to overstate substitution.
- It underestimates the price index relative to the base year.
- Consumption basket changes over time.
- As a solution to over or underestimation, there are other indices proposed.

  Fisher Ideal Index $P_f = \sqrt{PI_L \times PI_p}$ (Geometric mean of the two)

Selection of a Base Year: The Key Criteria

- A Normal year (no abnormalities in trade, production, price level and price variations)
- A year in which reliable production, price and other required data area available
- A year as latest as possible and comparable with the other data series

Wholesale Price Index (WPI)

- WPI measures the changes in the prices of goods in the stages before the retail level.
- This refers to goods that are sold in bulk and traded between businesses.
  - Includes prices of raw materials, semi-finished goods, imported tangible goods
  - Includes also prices of tangible goods if transacted at the wholesale level
  - Excludes prices of all services- education, health, banking, transport and communication
- For agriculture, marketed surplus is in use, not marketable surplus.
- Weighted Arithmetic Mean and Laspeyre's formula are used.
- The Office of the Economic Adviser in the Department of Industrial Policy and Promotion, Ministry of Commerce & Industry is responsible for compiling WPI and releasing it.

Measurement of WPI: An Example (Base 2011-12=100)

Major Group/Group	Weight		No. of Items		No. of Quotations	
	2011-12	2004-05	2011-12	2004-05	2011-12	2004-05
All Commodities	100.00	100.00	697	676	8331	5482
I Primary Articles	22.61756	20.11815	117	102	983	579
II Fuel & Power	13.15190	14.91021	16	19	442	72
III Manufactured Products	64.23054	64.97164	564	555	6906	4831

Primary articles: Food, non-food, minerals, crude petroleum and natural gas
Fuel and Power: Coal, Mineral oils, electricity
Manufactured products: Food, beverages, tobacco products, textiles, wearing apparel, leather and related products, wood and wood products, paper and paper products, printing and reproduction of recorded media, chemical and chemical products, Pharmaceuticals, rubber and plastic, other non-metallic mineral products, computer, electronic products, etc.

Consumer Price Index (CPI)

- The CPI is the measure of the average price paid by consumers (retail price) for a basket of consumer goods and services.
- A price index is constructed by weighing each price according to the economic importance of the commodities in question.
- Includes prices of services
- Excludes prices of capital goods (plants and equipment), raw-materials, intermediate goods
- $$\frac{price\ of\ basket\ of\ goods\ and\ services\ in\ current\ year}{price\ of\ basket\ in\ base\ year} \times 100 = C\text{PI}$$

Types of CPI

- CPI for Industrial Workers (CPI-IW): Labour Bureau, Ministry of Labour
- CPI for Urban Non-Manual Employees (CPI-UNME) (50% or more incomes from non-manual work outside agriculture): CSO
- CPI for Agricultural labourers (CPI-AL): Labour Bureau, Ministry of Labour
- These are first done at the State level and at select centres.
- Aggregation is done as the weighted arithmetic mean of the of the respective indices with weights taken as proportional to the aggregate expenditure of the State/Centre in all India figure.
- Laspeyre's index is used.
- For deciding weights of individual goods/services, surveys are conducted across the country.

CPI-IW: Group Weights

All-India Group weights

Group	1960=100	1982=100	2001=100
IA – Food	60.9	57.0	46.20
IB – Pan, Supari, Tobacco & Intoxicants	4.8	3.15	2.27
II - Fuel & Light	5.8	6.28	6.43
III - Housing	6.3	8.67	15.27
IV - Clothing, Bedding & Footwear	8.5	8.54	6.57
V - Miscellaneous	13.7	16.36	23.26
Total	100.0	100.00	100.00

Sr. No.	Group / Sub group	Weight for		
		CPI-IW 2001=100	CPI-AL 1986-87=100	CPI-RL 1986-87=100
I	**Food Group**			
	Cereals and Products	13.48	40.94	38.15
	Pulse and Products	2.91	3.39	3.40
	Oil and Fats	3.23	3.83	3.79
	Meat, Fish and Eggs	3.97	3.10	3.31
	Milk and Product	7.31	3.74	3.94
	Condiments and Spices	2.57	4.12	3.92
	Vegetable and Fruits	6.05	5.06	5.05
	Other food	6.68	4.97	5.21
	Total Food Group	**46.20**	**69.15**	**66.77**
	Pan, Supari, tobacco and intoxicants	2.27	3.79	3.70
II	**Fuel and Light**	**6.43**	**8.35**	**7.90**
III	**Housing Group**	**15.27**	**-**	**-**
IV	**Clothing, Bedding and Footwear**	**6.57**	**6.98**	**9.76**
V	**Miscellaneous**			
	Medical Care	4.56	4.38	4.23
	Education, Recreation and Amusement	6.18	0.94	0.99
	Transport and Communication	4.87	1.67	1.80
	Personal Care and Effects	4.22	2.04	2.28
	Others	3.43	2.70	2.57
	Total Miscellaneous Group	**23.26**	**11.73**	**11.87**
	Total	**100**	**100**	**100**

GDP Deflator : is the index of average price of all goods and services produced in the country (consumption, investment, govt purchases, and net exports). It is calculated by dividing nominal GDP by real GDP multiplied by 100.

- Includes all final goods
- Excludes intermediaries and raw materials

$\frac{Nominal\ GDP}{Real\ GDP} \times 100 = GDP\ Deflator$ (Based on Paasche's index)

In India, GDP deflator data are available on an annual basis.

GDP Deflator: An Example

Year	Nominal GDP	Real GDP	GDP Deflator
2012	10x10,000+120x400+780x50=187000	10x10000+120x400+780x50=187000	1
2020	15x12000+200x500+1000x75=355000	10x12000+120x500+780x75=238500	1.489

Inflation can be classified into three categories according to its severity: low inflation, galloping inflation and hyperinflation.

Low inflation: Low inflation is characterized by prices that rise slowly and predictably. When prices are relatively stable, people trust money because it retains its value from month to month and year to year.

Galloping inflation: Also called very high inflation, when inflation rate becomes double-digit or triple-digit percent per year. Galloping inflation is relatively common particularly in countries suffering from weak governments, war or revolution.

Hyperinflation: Hyperinflation is more dangerous than galloping inflation. In this situation, the real money stock falls drastically and relative prices become highly unstable.