INDEX NUMBER

MEANING OF INDEX NUMBER

An indicator of changes in the magnitude of a set of connected variables is a statistical instrument called an index number.

FEATURES / CHARACTERISTICS OF INDEX NUMBERS

1. Index numbers are particular types of averages: It is possible to compare two or more series using averages such as mean, median, or mode. That being said, averages cannot be used to compare two or more series if the units in which they are stated differ, or if the series are made up of various kinds of things. Index numbers come in handy when comparing changes in series.
2. Index numbers are stated as percentages: Regardless of the unit of measurement, percentages are used to express changes in a group's magnitude. This makes comparing two or more index numbers in various contexts easier. But the percentage symbol (%) is never utilized.
3. Index numbers quantify the impact of changes with respect to location or time: Index numbers are employed to compare changes that occur in categories, between places, and over time.
4. Index numbers quantify the change that cannot be quantified directly: Index numbers are designed to examine changes in the impacts of variables that are not directly measurable.

PROBLEMS IN CONSTRUCTION OF INDEX NUMBERS

1. **Index Numbers' Use:** There isn't a single "All Purpose Index." Each index has a distinct and constrained purpose.
    - Therefore, determining and precisely defining the index number's construction goal is the first stage in the process.
    - There would be confusion, waste of time, and money if we couldn't decide what the index's goal was.
2. **Base Year Selection:** An index number's base period is the time frame that serves as a foundation for evaluating variations in quantities or prices over a specific period of time.

    (i) There should be no irregularities or erratic variations within the base period. Examples of such abnormalities and fluctuations include wars, floods, famines, earthquakes, economic booms and busts, lockouts, labor strikes, etc.

    (ii) There shouldn't be a significant disparity between the base year and the current year: We shouldn't choose a base period that is too far in the past because index numbers are useful in decision-making and economic policies are sometimes a question of short periods of time.

    (iii) Fixed Base or Chain Base: The "fixed base method" choice is contingent upon the index number construction goal.
        - The fixed base method maintains a constant comparison period spanning all of the current years.

- The chain base technique compares changes in prices for a given year not with a predetermined year, but with the prices in the year before.

3. **Selection of number of items or commodities**
   - **(i)** The goods chosen ought to reflect the preferences, lifestyles, and traditions of the target audience for the index.
   - **(ii)** There shouldn't be an excessive amount of stuff overall.
     - The index number won't be representative if there aren't enough items; and
     - An excessively big value will result in a more representative index, but the cost and effort associated with it will increase.
   - **(iii)** It is important to choose the standardized or graded commodities carefully in order to make legitimate and insightful comparisons.

4. **Data sources chosen:** Since the data is dispersed over a big area, there's a potential it contains false information. As a result, it is imperative that the data be accurate, consistent, sufficient, comparable, and representative.
5. **Price quotations:** You can choose locations that are well-known for trading that specific commodity in order to get a price quotation.
   - Techniques for Quoting Prices: There are two ways to quote prices:
   - **(i)** Money prices: Here, costs are stated for each unit of a good.
   - **(ii)** Quantity prices: Quotes for quantity are given in terms of money units.

6. **Choosing the Average:** When creating index numbers, a variety of averages can be utilized, including geometric, arithmetic, mode, and median.
   - Of all the averages, the arithmetic mean is the most basic. But, the extreme goods have an impact on it.
   - Since the geometric mean gives greater weight to smaller things and less weight to larger objects, it is theoretically the optimal average.

7. **Appropriate weight selection:** The relative value of various objects is indicated by their "weight." Value weights or quantity weights are the two possible types of weights:

   - When different commodities are given varying degrees of importance based on how much of them are used, bought, or consumed, quantity weights are appropriate.
   - Value weights make sense when different commodities are assigned weights based on the costs associated with them.
     - **(1)** Implicit weights: Weights are deemed implicit when commodities are chosen to encompass several types.
     - **(2)** Explicit weights: When there are explicit weights, there is external proof of the significance of different index entries.

8. **Choosing the right formula:** Different formulas or techniques have been developed by constructed. the statisticians who used techniques like Laspeyre's, Paasche's, Bowley's, Fisher's, etc. to create the index numbers.

TYPES OF INDEX NUMBERS

1. Price Index Numbers: These numerical values quantify the overall variations in prices between the base year and the current year.
    - The value of money is determined by the General Price Index.
    - The price index numbers are the most significant of all the index numbers and are frequently used in a variety of commercial and economic applications.
    - When the percentage changes in prices for various commodities differ, the price index can be used to describe these changes by a A "Wholesale Price Index" or a pricing type may be used as a price index. a solitary number.

        (i) Wholesale Price Index Numbers: These represent the average price level for a collection of goods when considered collectively. It is the most widely used pricing index in the policy market and commercial sector in India. It serves as a gauge for the inflation rate.
        (ii) Index Numbers for Retail Prices: Retail pricing of various goods, such as food, housing, and clothing, are reflected in general fluctuations in these areas. One important indicator of a nation's cost of living is the retail price index, of which the "Consumer Price Index" is a particular kind.

2. **Quantity Index Numbers:** We can compare changes in the physical quantity of things produced, consumed, or sold by using the quantity or volume index numbers, which reflect average changes in quantities.
    - An easy way to study an economy's physical output level is with this kind of index number.
    - Both the weighted technique and the simple method can be used to construct them. Thus, by simply switching the p's and q's, the Quantity Index Number may be obtained from the Price Index Numbers.
    - Quantity Index Numbers are used to represent the indices of industrial production, agricultural production, exports, imports, etc.

3. Value Index figures: These figures make a comparison between the overall value of a given period and the base period's total value.
    - Value index numbers can be used to study changes in the overall value (price × quantity) of production, such as retail sales indices, profit indices, or inventories.

CONSUMER PRICE INDEX

Meaning

The Consumer Price Index shows how much commodities have increased on average for a class of people to maintain the same level of living in the current year as they did in the base year.

The process of creating the Consumer Price Index

1. Determining the Index's scope and coverage: The first step is to identify the specific class of people for whom the index numbers are intended, such as government employees, industrial workers, members of the lower or middle class, etc.

- The coverage should also be clearly designated, i.e., the geographic area - rural or urban, city or town, etc. — in addition to the class of people.
- From the perspective of income and habits, the chosen class must consist of a homogeneous set of individuals.

2. Family Budget Enquiry: The following action entails choosing at random a sufficient number of representative families from the population class for which the index is intended in order to perform a family budget inquiry.
   - A typical era of economic stability should be used to conduct the inquiry.
   - A family budget inquiry can be used to determine the average amount of money spent by a family on various consumption goods.
3. Getting Price Quotes: Gathering retail prices is the final and third phase.
   - It's a challenging and crucial task. The explanation for this is that retail prices differ from location to location, store to store, and even client to client.

Methods of Constructing CPI

(i) The Weighted Aggregate Method or Aggregate Expenditure Method;
(ii) The Family Budget Method or the Weighted Average of Price Relatives Method.

Aggregate Expenditure Method

Apply the formula:

Consumer price index $= \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$

Family Budget Method

Apply the formula :

Consumer price index $= \frac{\Sigma RW}{\Sigma W}$

INDEX OF INDUSTRIAL PRODUCTION

Changes in the level of industrial production across many industries are measured by the industrial production index number.

USES OF INDEX NUMBERS

1. Aids in the Formulation of Policies: Index numbers are essential management tools for both government and non-governmental organizations.
   - They support the study of patterns in a variety of phenomena, and many policy decisions are based on these trends and tendencies.
   - They are also employed in the formulation and planning of numerous corporate and governmental policies.
2. Index numbers serve as Economic Barometers: An atmospheric pressure measuring device is called a barometer. They gauge the health of a nation's economy and serve as a barometer for changes in the overall state of affairs.

3. Assisting with trend analysis: Index numbers are a great tool for analyzing the tendency or trend of a series spread over time.
    - They assist in determining the patterns of industrial production, prices, imports, exports, and a host of other phenomena.
    - They also assist in projecting future trends, which is crucial for the operation of any business or manufacturing activity in the future and for getting a general notion of one's future course of action.
4. To measure and compare changes: Comparing changes in two variables is made easier with the use of index numbers.
    - Changes cannot be quantified in absolute terms. However, index numbers offer a comparative measurement of variations in the strength of a set of variables.
    - It is simple to compare the variations throughout time and space.

5. Index numbers are useful for calculating purchasing power: The worth of money is based on its purchasing power, which is based on commodity prices. The value of money is negatively impacted by price changes.
    - The worth or purchasing power of money decreases as prices rise. It is sometimes stated that a rupee's purchasing power in 1980 is equivalent to just 20 paise today.
6. Index numbers are useful for deflating different values: The price index number aids inadjusting the monetary values of different pricing eras.

INDEX NUMBER'S LIMITATIONS

1. Only gives relative changes: Index values are merely approximations of the relative changes in a range of occurrences. Since they are merely approximations, they are unable to communicate the truth. They stand for the generalized truth, which is determined by taking the average of every item. Therefore, individual units are not covered by it.
2. Inadequate Accuracy: Index numbers are frequently determined using sample data, meaning that not every item is taken into account. An erroneous approach of sample selection or insufficient samples will inevitably lead to inaccurate results for the index number.
3. Distinction between construction technique and purpose: An index number created using a particular approach for a particular purpose will not be suitable for all other purposes or circumstances. It is inevitable that incorrect conclusions will be drawn if they are used for other reasons.
4. Ignores qualitative changes: No consideration is given to variations in the product's quality when calculating the pricing or production index figures. A price increase could be the result of the product's quality improving. The index numbers do not represent such modifications.
5. Manipulations are conceivable: It is feasible to build index numbers in a way that yields the desired outcome. One way to manipulate this kind of data is to select a specific base year, set of commodities, set of prices, etc.

NUMBERS OF THE WHOLESALE PRICE INDEX

The price index numbers that track overall shifts in a nation's wholesale prices of goods are known as wholesale price index numbers.

Groups of Commodities for Wholesale Price Index (WPI)

1. Primary Articles: These are products made from natural resources, such as grains, rice, pulses, fruits, vegetables, minerals, etc. There are 98 products in this category, with weights of 22.02%.
2. Energy Articles: Items such as fuel, electricity, coal, power, and petroleum products fall under this category. There are 19 items in this category, and they have a 14.23% weight.
3. Manufactured Articles: This category covers items that are made, such as fertilizers, chemicals, sugar, edible oil, textiles, machinery, paper, and leather goods.
    - There are 318 pieces in this group, and 63.75% of the weight is assigned to them.
    - In other words, manufactured goods are almost two thirds as important as raw materials in the WPI.

Utility of Wholesale Price Index Number

1. Inflation Indicator: An increase in the overall level of prices that is steady and noticeable is considered inflation. The wholesale price index is used as a gauge of inflation in economics.
    - The rate at which money's purchasing power is declining is indicated by an increase in the WPI.
2. Predicting Supply and Demand: The wholesale pricing indices are useful for predicting the amount of commodities that the economy will require and how much of each.
    - A situation of excess demand is indicated by an increase in the wholesale price index.
    - Conversely, a decline in the wholesale price index indicates that there is an excess supply of goods relative to the demand.
3. Assists in ascertaining actual alterations in aggregates: WPI is employed to eradicate the impact of price fluctuations on aggregates like capital formation, national income, and so forth.
    - In the event that the resulting figure is identical to the base year, the economy has either not grown or the actual production has stayed constant.
    - In contrast, the economy is increasing at that rate if the final value is higher than the base year's value.
4. Helpful in the Cost Evaluation of Different Projects: Large-scale projects such as the building of an airport or shopping centers require long-term funding commitments.
    - As prices climb over time, the project's initial anticipated cost will also increase.
    - The wholesale price index indicates the inflation rate, which must be taken into account when estimating the revised price.
    - When estimating the true cost of these kinds of projects, wholesale price indices come in handy.
5. A scenario characterized by a persistent rise in the general price level is called inflation. Inflation cannot be defined as a slight increase in prices or an erratic rise in prices. Inflation is the term for a steady and noticeable increase in costs.
    - The most popular price index for determining the rate of inflation in the economy is the wholesale price index, or WPI.

- It is the only all-inclusive index that tracks changes in commodity prices across all trades and transactions.
- WPI is accessible with a maximum time lag of two weeks, occurring every week.

FORMULAE AT A GLANCE

1.	**UNWEIGHTED INDEX NUMBERS**	
	(1) simple aggregative method	$P_{01}=\frac{\Sigma P_1}{\Sigma P_0}\times 100$
	(2) simple average of price relatives	$P_{01}=\frac{\Sigma\left(\frac{P_1}{P_0}\times 100\right)}{N}$
2.	**WEIGHTED INDEX NUMBERS**	
2.1 Weighted Aggregative Method		
	(1) Laseyre's Method	$P_{01}=\frac{\Sigma P_1 q_0}{\Sigma p_0 q_0}\times 100$
	(2) Paasche's Method	$p_{01}=\frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}\times 100$
	(3) Fisher's Method	$p_{01}=\sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0}\times\frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}}\times 100$
2.2 Weighted Average Of Price Relatives Method		$p_{01}=\frac{\Sigma RW}{\Sigma W}$
3.	**CONSUMER PRICE INDEX**	
	(1) Aggregate Expenditure Method	$\text{CPI}=\frac{\Sigma P_1 q_0}{\Sigma p_0 q_0}\times 100$
	(2) Family Budget Method	$\text{CPI}=\frac{\Sigma RW}{\Sigma W}$
4.	**INDEX OF INDUSTRIAL PRODUCTION**	
Index Number of Industrial Production = $\frac{\Sigma\left(\frac{P_1}{P_0}\times 100\right)W}{\Sigma W}$		