

Business Mathematics & Statistics

NCWEB Hansraj Centre

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Topics discussed:

- ❑ Meaning and Concept of Index Numbers
- ❑ Characteristics of Index Number
- ❑ Uses of Index Numbers
- ❑ Issues in Construction of Index Numbers
- ❑ Classification of Index Numbers

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Section A


CONCEPT OF INDEX NUMBERS

Index numbers are a series of numbers devised to measure changes over a specified time period (the time period may be daily, weekly, monthly, yearly, or any other regular time interval), or compare with reference to one variable or a group of related variables. Thus, each number in a series of specified index number is:

- a) A pure number i.e., it does not have any unit.
- b) Calculated according to a pre-determined formula.
- c) Generated at regular time intervals, sometimes during the same time interval at different places.
- d) The regular generation of numbers form a chronological series.
- e) With reference to some specified period and number known as base Index Number period and base number, the latter is always 100.

Characteristics of Index Number

- 1) Relative measurement : Index number are used for comparing relative change in a variable or group of variables at different point of time or place.
- 2) Specialized average : Index number is a special type of average that provides a measurement of relative changes in a variable or group of variables.
- 3) Measurement of changes not capable of direct measurement : with the help of index number, we can measure the changes in magnitude which are not capable in direct measurement due to their complex nature.
- 4) Measurement of common characteristics of a group of items : Index express the common characteristics of a group of items change in index does not always mean that there is a change in all the variables for example, an increase in price index does not mean that price of all the commodities are increased.

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- 5) Comparison on the basis of time or place : Index number is used to measure the relative changes either on the basis of time or on the basis of place for example production of wheat in Uttar Pradesh for two different period or production of wheat in Uttar Pradesh and Haryana in the same period.
 - 6) Expressed in percentage : Index numbers are expressed in percentages to show the relative change through the sign of percentage (%) is never used.
 - 7) Universal use : The technique of Index number is being used extensively in all the fields now a days be it changes in production, trade, etc.

USES OF INDEX NUMBERS

1. Decision makers use index numbers as part of intermediate computations to understand other information better. Nominal income can be transformed into real income. Similarly, nominal sales into real sales & so on ..., through an appropriate index number.
2. Different types of price indices are used for wage and salary negotiations, for compensating in price rise in the form of DA(Dearness Allowance).
3. Various indices are useful to the Government in framing policies. Some of these include taxation policies, wage and salary policies, economic policies, custom and tariffs policies etc.
4. Index numbers can also be used to compare cost of living across different cities or regions for the purpose of making adjustments in house rent allowance, city compensatory allowance, or some other special allowance.

- 5) Indices of Industrial Production, Agricultural Production, Business Activity, Exports and Imports are useful for comparison across different places and are also useful in framing industrial policies, import/export policies etc.
- 6) BSE SENSEX is an index of share prices for shares traded in the Index Number Bombay Stock Exchange. This helps the authorities in regulating the stock market. This index is also an indicator of general business activity and is used in framing various government policies. For example, if the share prices of most of the companies comprising any particular industry are continuously falling, the government may think of changes in its policies specific to that industry with a view to helping it.
- 7) Sometimes, it is useful to correlate index related to one industry to the index of another industry or activity so as to understand and predict changes in the first industry. For example, the cement industry can keep track of the index of construction activity. If the index of construction activity is rising, the cement industry can expect a rise in demand for cement.

Issues in Construction of Index Numbers

There are three major issues which may be faced in the construction of index numbers.

They are: 1) Collection of Data; 2) Selection of Base Year and 3) Selection of Appropriate Index. Let us discuss them in detail:

1) **Collection of Data:** Data collection through a sample method is one of the issues in the construction of index numbers. The data has to be as reliable, adequate, accurate, comparable, and representative, as possible. Here a large number of questions need to be answered

i) **Identification of Commodities to be Included :** How many and which category of commodities to include? A large number of items may be present. It is not possible to include all of them, only those items deserve to be included in the construction of an index number as would make it more representative. Therefore, it is worthwhile to note that the selection of items must be deliberate and in keeping with the relevance and significance of each individual item to the purpose for which the index is constructed.

ii) **Sources of Data** : From where to collect data? It is an important and difficult issue. The source depends on the information requirement. For example, one may need to collect prices and quantities consumed related to certain commodities for a consumer price index. However, there may be a large number of retailers and wholesalers, selling the commodities, and quoting different prices. To get the details, only a few representative shops (which represent the typical purchasing points of the people under question) need to be selected.

iii) **Timings of Data Collection** : It is also equally important to collect the data at an appropriate time. Referring to the example of consumer price index, prices are likely to vary on different days of the month. For certain commodities prices may vary at different times of the same day.


Take an example, vegetable prices are usually high in the morning when fresh vegetables arrive and are low in the late evening when sellers are closing for the day and wish to clear the perishable stock. For each commodity, individual judgment needs to be exercised to represent reality and to serve the purpose for which an index is to be used.

2) **Selection of Base Year:** A base period is the reference period for comparing and analysing the changes in prices or quantities in a given period. For many index number series, value of a particular time period, usually a year, is taken as reference period against which all subsequent index numbers in the series are calculated and compared.

In some other cases, especially when cost of living needs to be compared across the cities, the value of cost of living prevailing in a selected city is taken as a base against which cost of living in other cities is compared.

In yet other cases, we may be required to compare one index number series against another series. In such a context, a 'base' common to all series is more appropriate.

In the light of the above considerations, therefore, the period/year selected as base period/year must be a 'normal' period. Normal period is a period with price or quantity figures neither too low, nor too high. It should not have been affected by abnormal occurrences, such as floods, (if interested in agricultural production), wars, sudden recession etc.



3) **Selection of an Appropriate Index:** Different methods of indices give different results, when applied to the same data. Utmost care must be taken in selection of a formula which is the most suitable for the purpose. Whether to use an unweighted or weighted index is a difficult question to answer. It depends on the purpose for which the index number is required to be used. For example, if we are interested in an index for the purpose of negotiating wages or compensating for price rise, only a weighted index would be worthwhile to use.

CLASSIFICATION OF INDEX NUMBERS

There are three principal types of indices: price indices, quantity indices, and value indices.

Price Indices : This type of indices is the most frequently used. Price indices consider prices of a commodity or a group of commodities and compare changes of prices from one period to another period and also compare the difference in price from one place to another. For example, the familiar Consumer Price Index measuring overall price changes of consumer commodities and services is used to define the cost of living.

Quantity Indices : The major focus of consideration and comparison in these indices are the quantities either of a single commodity or a group of commodities. For example, the focus may be to understand the changes in the quantity of paddy production in India over different time periods. For this purpose, a single commodity's quantity index will have to be constructed.

Value Indices : Value indices actually measure the combined effects of price and quantity changes. For many situations either a price index or quantity index may not be enough for the purpose of a comparison. For example, an index may be needed to compare cost of living for a specific group of persons in a city or a region. Here comparison of expenditure of a typical family of the group is more relevant. Since this involves comparing expenditure, it is the value index which will have to be constructed. These indices are useful in production decisions, because it avoids the effects of inflation.

The formula, therefore is:

$$\text{Value Indices } Iv = \frac{\sum p_1 q_1}{\sum p_0 q_0} \times 100$$



Thank You