# 11

# INDEX NUMBERS

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**An index number** is a statistical measure of the change in a variable from one period to another. Price indices, quantity indexes, value indexes, and socio-economic indexes are examples of index numbers.
Index number construction combines time series data that can't be added due to different units. To measure composite changes in production or prices, relatives (percentage changes) are averaged, allowing for comparable and additive data. Weights are applied based on importance. The resulting average relative is called an index number, expressed relative to a specified base period, allowing for meaningful comparisons and analysis of business conditions.

**Price Relatives:** A price relative is an index number that compares the price of a single commodity in a given period to its price in a base or reference period.
**Quantity or Volume Relatives:** These are like price relatives but compare quantities or volumes instead of prices, such as production or consumption.
**Value Relatives:** Value relatives compare the total value of a commodity between two periods, incorporating both price and quantity.
**Link and Chain Relatives:** Link relatives express an index as a percentage of the previous period, forming a chain index by multiplying successive link relatives.

Two basic methods are used in the calculation of index numbers:

i. *Simple (unweighted) Aggregate Method:* Expresses aggregate prices as a percentage of base year prices. Easy and quick, but it ignores differing importance of commodities and can't handle different units.
ii. *Weighted Aggregate Method:* Assigns weights to commodities based on importance. Allows for differing importance and units.

Weighting is essential to ensure the index accurately reflects the changes being measured.
*Example:* A **price index** measures the percentage change in the price of an item from one period to another. A price index could be simple or aggregate.

## SIMPLE PRICE INDEX

A **simple price index** measures the percentage change in the price of a single commodity from one period to another. The **base period** is the point in time in the past against which all comparisons are made.

**Simple price index:**

$$I_i = \frac{P_n}{P_0} \times 100$$

Where $I_i$ = price index for year *i;* $P_n$ = price for year *i;* $P_0$ = price for the base year.

☑ **EXAMPLE 11.1**

Consider the price of fuel in Nigeria from 2010 to 2018 as shown in the following table.

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Fuel Price | 65 | 65 | 97 | 97 | 97 | 87 | 145 | 145 | 145 |

a) Compute the simple price index for 2015, using 2010 as the base year.
b) Compute the simple price index for 2018, using 2015 as the base year.

SOLUTION**tips**

a) The simple price index for 2015 is

$$I_i = \frac{P_n}{P_0} \times 100\% = \frac{87}{65} \times 100\% = 133.85$$

Thus, fuel price was 33.85% higher in 2015 than in 2010.

b) The simple price index for 2018 is

$$I_i = \frac{P_n}{P_0} \times 100\% = \frac{145}{87} \times 100\% = 166.67$$

Thus, fuel price was 66.67% higher in 2018 than in 2015.

## AGGREGATE PRICE INDICES

An **aggregate price index** measures the percentage change in the prices for a group of commodities from one period to another. The unweighted aggregate price indices and weighted aggregate price indices are the two types of aggregate price indices. An **unweighted aggregate price index** places equal weight on all the items in the market basket.

**Unweighted aggregate price index:**

$$I_u = \frac{\sum P_n}{\sum P_0} \times 100$$

Where $I_u$ = value of the unweighted price index at time *t*; $\sum P_n$ = sum of the prices of the commodities at time *t;* $\sum P_0$ = sum of the prices of the commodities at time 0.

☑ **EXAMPLE 11.2**

The table shows the mean prices for three earpiece brands for selected periods from 2000 to 2025

| *Earpiece* | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|
| Sounder | 97 | 54 | 96 | 61 | 75 |
| Playtrix | 84 | 83 | 87 | 87 | 98 |
| Ringer | 69 | 93 | 72 | 69 | 99 |

Calculate the unweighted aggregate price index for (a) 2010 using 2000 as the base period. (b) 2020 using 2010 as the base period.

SOLUTION**tips**

a) The unweighted aggregate price index for 2010 using 2000 as the base period is