

CHAPTER SEVEN : INDEX NUMBERS**Introduction**

- An index is a measure, over time, of the average changes in the values of a group of items.
- It comprises a series of index numbers with the value for the base year = 100.
- An index number measures the % change in the value of some economic commodity over a period of time.
- It shows the changes in price, quantity, wages, productivity, expenditure and others at a point of time compared to the base year.
- Index numbers, therefore, are not concerned with absolute values but rather the movement of values

The simple Price Index

Year	Price (RM)		Index	%↑
1	0.50	$\frac{0.50}{0.50} \times 100$	100	
2	0.60	$\frac{0.60}{0.50} \times 100$	120	20%
3	0.80	$\frac{0.80}{0.50} \times 100$	160	60%
4	0.94	$\frac{0.94}{0.50} \times 100$	188	88%

Different Types of Index Numbers

1. Price Index
2. Quantity index
3. Value index
4. Productivity index
5. Share Price index

Price Index

It shows the changes in price at a point of time compares with the base year.

- a. The Laspeyres Price Index

This index uses the quantities in the base year as comparison.

$$L_{PI} = \frac{\sum P_n Q_0}{\sum P_o Q_o} \times 100$$

- b. The Paasche Price Index

This index uses the quantities in the current year as comparison.

$$P_{PI} = \frac{\sum P_n Q_n}{\sum P_o Q_n} \times 100$$

Example 1

From the data given below, using 2002 as the base, find:

- i. the Laspeyres price index
- ii. the Paasche price index

Item	2000		2002	
	Price per unit	Unit Quantity	Price per unit	Unit Quantity
A	1.10	15	1.35	20
B	0.70	30	0.90	31
C	0.60	7	0.65	9

Solution

Item	P_o	Q_o	P_n	Q_n	$P_o Q_o$	$P_o Q_n$	$P_n Q_o$	$P_n Q_n$
A	1.10	15	1.35	20	16.5	22.0	20.25	27.0
B	0.70	30	0.90	31	21.0	21.7	27.0	27.9
C	0.60	7	0.65	9	4.2	5.4	4.55	5.85
					41.7	49.1	51.8	60.75

$$\begin{aligned} \text{Laspeyres Price Index} &= \frac{\sum P_n Q_o}{\sum P_o Q_o} \times 100 = \frac{51.8}{41.7} \times 100 = 124.2 \\ \text{Paasche Price Index} &= \frac{\sum P_n Q_n}{\sum P_o Q_n} \times 100 = \frac{60.75}{49.4} \times 100 = 123.8 \end{aligned}$$

Disadvantages of Laspeyre's Price Index

- Laspeyres price index tends to overstate inflation.
- The index implicitly assumes that whatever the price changes the quantities will remain the same.
- In terms of economics theory, no substitution is allowed to take place.
- Even if goods become relatively more expensive, it assumes that the same quantities are bought.
- As a result, this index tends to overstate inflation.

Disadvantages of Paasche Price Index

- Paasche price index tends to understate inflation. The effects of substitution would mean that greater importance is placed on goods that are relatively cheaper now. As a result, this index tends to understate price.
- The comparison between years is different because the index reflects both changes in price and quantity.
- The index requires information on the current quantities and this may be difficult or expensive to obtain.

Quantity Index

The Laspeyres and Paasche methods of index can also be used to measure quantity movements with prices as the weights.

a. The Laspeyres Quantity Index

This index uses the prices in the base year as comparison.

$$L_{QI} = \frac{\sum Q_n P_0}{\sum Q_o P_o} \times 100$$

b. The Paasche Quantity Index

This index uses the prices in the current year as comparison.

$$P_{QI} = \frac{\sum Q_n P_n}{\sum Q_o P_n} \times 100$$

Example 2

The table below shows the price (P) and quantity sold (Q) (in thousands) of two brands of a product X for the years 2002 to 2004.

Product X	2002		2003		2004	
	P	Q	P	Q	P	Q
Brand A	8	6.4	10	6.5	9	5.3
Brand B	10	10.08	12	9.5	11	6.9

- i. Calculate Laypeyres and Paasche quantity indices for overall sales of Product X.
- ii. Comment on your results.

Value Index

It measures the change in value.

$$I = \frac{\sum P_n Q_n}{\sum P_o Q_o} \times 100$$

General Price Index (CPI)

- CPI measures average changes in price for a range of goods and services bought by a typical household.
- CPI represents the change in the cost of a large 'basket' of goods and services reflecting the full range of things that people buy.

Limitation of Index Numbers

- Index numbers are usually only approximations of the changes in price or quantity over time.
- Taste and consumption pattern changes over time, so does the weighting. Hence, the index values might not be representative of the actual.
- The base period of an index should be a 'normal year', but selecting such a year is only an approximation because no particular year may be called a 'normal year'.
- Data that is used to compute index numbers might be out-of-date, incomplete or inaccurate.
- Since an index number is an average, it will have the advantages and disadvantages of an average.

Learning Outcomes

- Students should be able to differentiate the types of index.
- Students should be able to calculate price index and quantity index.
- Students should be able to calculate Paasche index and Laspeyres index.

Basic Reading

1. Saravanan Kullandavelli (1994) LCCI Business Statistics; 5th ed. Malaysia; Stamford College Group Publishing.
2. A Francis (1995) Business Mathematics and Statistics; 4th ed. London DP Publications Ltd.

Revision Questions

1. The following data shows the sales of a particular product X for the years 2002 and 2003.

Year	Prive per unit (RM)	Quantity Sold
2002	10	1200
2003	23	500

Calculate Laypeyres and Paasche price index, quantity index and value index.

2. The following table shows the unit price and quantity consumed for the three types of household commodities in 2002, 2003 and 2004.

	2002		2003		2004	
Commodit y	Price	Quantit y	Price	Quantity	Price	Quantity
A	0.50	800	0.55	810	0.70	600
B	0.10	900	0.15	880	0.15	950
C	0.25	1200	0.25	1250	0.50	1300

- a. Calculate Laspeyres and Paasche price index.
- b. Calculate Laspeyres and Paasche quantity index.
- c. Comment on your results.