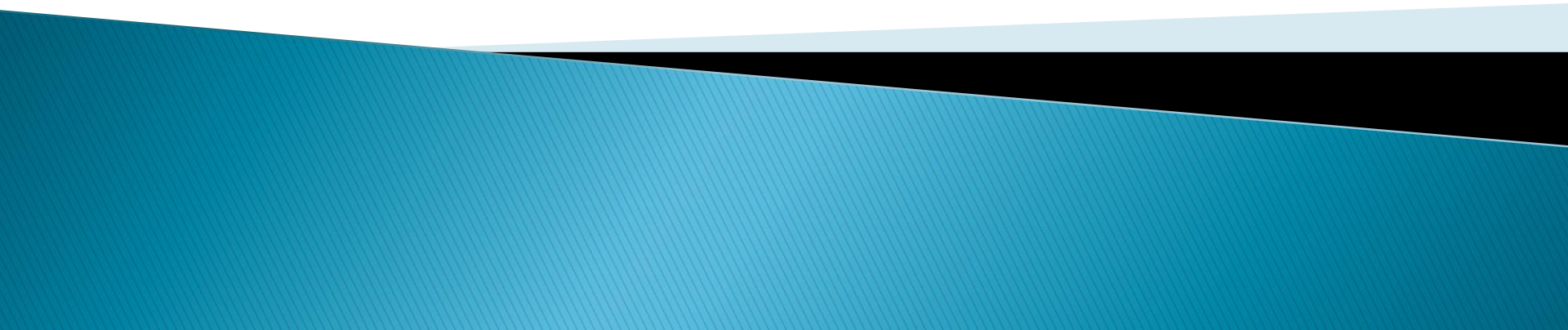# Chapter (15)
Index Numbers
Examples

The index number : Measures the change in a variable over time.

There are two types of index number:

1- A simple index number
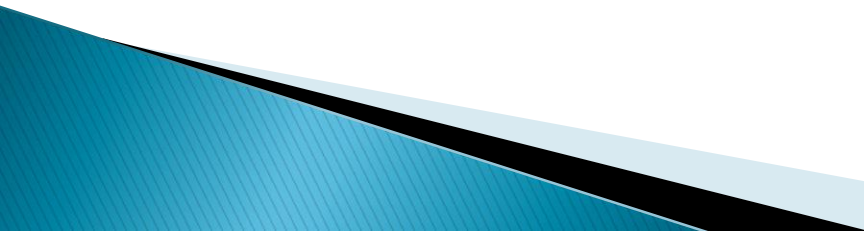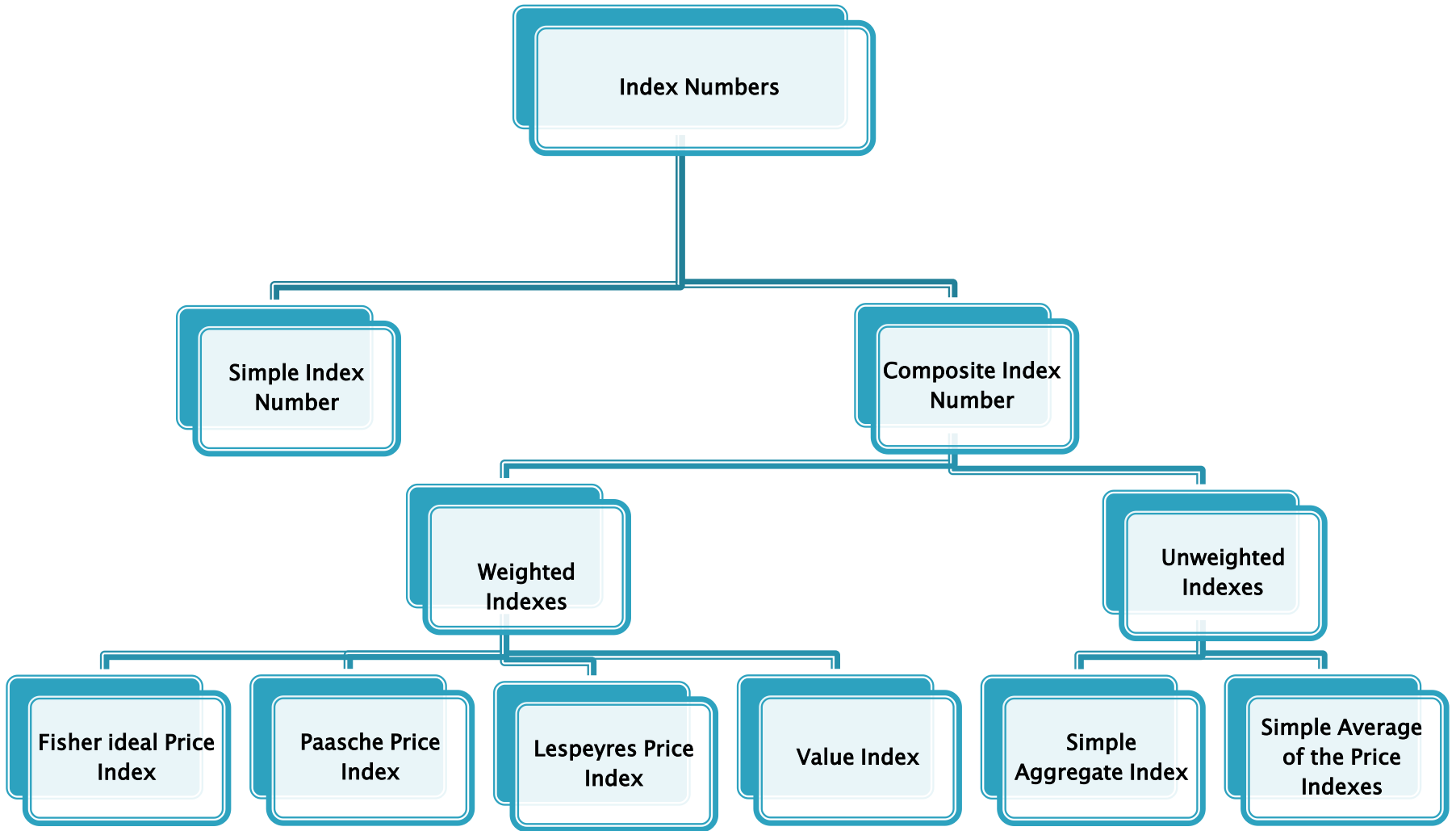
2- Composite numbers(Indexes)

The Composite numbers three types

- **Unweighted** (Simple Average of the Price Indexes ,Simple Aggregate Index)

- **Weighted** (Laspeyres ,Paasche ,Fisher's ideal and value index)

-**Special Purpose Index**(Consumer Price Index, Producer Price Index ,S&P Index

▸ For example an index number is used to measure changes in national income, employment, production, wages, prices etc over a period of time.

▸ Two types of periods(places , ……) are used for the purpose of comparisons i.e. base period and current period.

▸ – The Period under comparison is called **current period** .

▸ – The period with which comparison is made is called the **base Period** .

Simple index number

$$= \frac{\text{Value of the variable in the Period under comparison}}{\text{Value of the variable in the base period}} * 100$$

Example (1)

In one of the countries the value of exports during the month of March 2013 (16473) million riyals compared (17510) million during the month of March in 2012,
Calculate the index issued in March 2013 compared Outbound in March 2012.

Solution

$$\text{Exports index} = \frac{\text{The value of exports of March 2013}}{\text{The value of exports of March 2012}} * 100$$

$$\text{Exports index} = \frac{16473}{17510} * 100 = 0.94$$

Exports in March 2013 decreased by 6% compared to exports in March 2012

Example (2)

The GDPs of country (1) and country (2) are US$4,814 billion and US$2,088 billion respectively.

What is the GDP index of country (1)   compared with that of country (2) ?

(GDP : Gross Domestic Product)

Solution

$$\text{GDP index} = \frac{\text{The value of GDP in the country 1}}{\text{The value of GDP in the country 2}} * 100$$

$$\text{GDP index} = \frac{4814}{2088} * 100 = 230.56\%$$

The value of GDP in the country 1 is greater than the value of GDP in the country 2 at a rate equal to 130.56%

Example (3)

the table represent of sales for airline tickets sold ▶
by the some company . Annual sales (in £000s) are
as follows:

Year	2005	2006	2007	2008	2009	2010
Sales	6.4	4.7	5.4	6.9	7.8	6.8

Using 2006 as the base year ,find the index numbers for sales of airline tickets over the whole period.

Solution

If the 2006 base period:

$$Sales\ index = \frac{Sales\ of\ tikets(i)}{Sales(2006)} * 100$$

$$= \frac{Sales\ of\ tikets(i)}{4.7} * 100$$

Year	Sales	Sales index (2006)
2005	6.4	136.17
2006	4.7	100
2007	5.4	114.89
2008	6.9	146.81
2009	7.8	165.96
2010	6.8	144.68

Un weighted Indexes

▸ **Simple Average of the Price Indexes**

$$Simple\ Average\ of\ the\ price = \frac{\sum P_i}{n}$$

P_i : The simple index for each of the items.

n : The number of items

▸ **Simple Aggregate Index**

$$\boldsymbol{Simple\ Aggregate\ index = P = \frac{\sum P_t}{\sum P_0}}$$

$\sum P_t$: The sum of the prices for the period under comparison .

$\sum P_0$: The sum of the prices for the base period

Weighted Indexes :

- $Laspeyres\ Index = \dfrac{\sum P_t q_o}{\sum P_0 q_0} * 100$

- $Paasche\ Index = \dfrac{\sum P_t q_t}{\sum P_0 q_t} * 100$

- $Fisher's\ index = \sqrt{L * P}$

- $Value\ Index = \dfrac{\sum P_t q_t}{\sum P_0 q_0} * \mathbf{100}$

Example(4)
A company buys four products with the following characteristics:
  Number of units bought : q   Price paid per unit ($) : P

1- Find the Simple Average of the Price Indexes and Simple Aggregate
Index for this group of products for 2006 , using 2005 as the base.

2- compute the Weighted Indexes (Laspeyres , Paasche , Fisher and Value
index) if the base year (2005) and compeer year (2006).

Items	2005		2006	
	P	q	P	q
A	5	20	6	24
B	11	55	13	51
C	9	63	8	84
D	10	28	10	34

$$Simple\ Average\ of\ the\ price = \frac{\sum P_i}{n} =$$

$$\frac{1.2 + 1.18 + 0.89 + 1}{4} * 100 = 106.75$$

Prices increased by 6.75% in 2006, compared to prices in 2005.

$$Simple\ Aggregate\ index = \frac{\sum P_t}{\sum P_0}$$

$$= \frac{6 + 13 + 8 + 10}{5 + 11 + 9 + 10} = \frac{37}{35} = 105.71\%$$

Items	P_0(2005)	P_t(2006)	Simple index
A	5	6	6/5 =1.2
B	11	13	13/11=1.18
C	9	8	8/9 =0.89
D	10	10	10/10 =1
Total	35	37	4.27

Items	2005		2006					
	P_0	q_0	P_t	q_t	$p_t q_0$	$p_0 q_0$	$p_t q_t$	$p_0 q_t$
A	5	20	6	24	120	100	144	120
B	11	55	13	51	715	605	663	561
C	9	63	8	84	504	567	672	756
D	10	28	10	34	280	280	340	340
Total					1619	1552	1819	1777

- $Laspeyres\ Index = \dfrac{\sum P_t q_o}{\sum P_0 q_0} = \dfrac{1619}{1552} * 100 = 104.32$

- $Paasche\ Index = \dfrac{\sum P_t q_t}{\sum P_0 q_t} = \dfrac{1819}{1777} * 100 = 102.36$

- $Fisher's\ index = \sqrt{L * P} = \sqrt{104.32 * 102.36} = 103.34$

- $Value\ Index = \dfrac{\sum P_t q_t}{\sum P_0 q_0} * 100 = \dfrac{1819}{1552} * 100 = 117.2$