



The price of goods and services changes over time, but usually at different rates. A price index is a measure which compares how these prices change between different periods of time. This activity shows you how to calculate an index in three different situations.

### Information sheet

There are several price indexes, of which the most straightforward is the **Laspeyres Index**.

The Laspeyres Index is calculated by working out the cost of a group of commodities at current prices, dividing this by the cost of the same group of commodities at base period prices, and then multiplying by 100.

This means that the base period index number is always 100. Periods with higher prices have index numbers greater than 100. This index is practical and easy to understand.

Price indexes have many uses. Those covering a large range of goods and services can be used to measure changes in a country's cost of living.

The formula for calculating a Laspeyres index is:

$$I_L = \left( \frac{\sum P_{it} Q_{i0}}{\sum P_{i0} Q_{i0}} \right) \times 100$$

where

$P_{i0}$  is the price of commodity  $I$  at time  $0$

$Q_{i0}$  is the quantity of commodity  $I$  at time  $0$

$P_{it}$  is the price of commodity  $I$  at time  $t$

A **fixed base** Laspeyres index is said to be **weighted** by quantities in the base period.

### Think about...

What do the summations  $\sum P_{i0} Q_{i0}$  and  $\sum P_{it} Q_{i0}$  calculate?

### Reflect on your work

**When you have worked through the worksheets ...**

What does a Laspeyres index of 106 mean?

What is the Laspeyres index value that suggests a 2% fall in prices?

Laspeyres index is a 'fixed base' index. What does 'fixed base' mean?

Give reasons why the Laspeyres index may not be very accurate.

How could the accuracy be improved?

### Try this ... Task 1 Coffee shop

I buy drinks at a coffee shop each day I am at work.

The table below shows the number of drinks I bought last week and their prices.

Drink	Price	Quantity bought	Cost
White coffee	£1.20	7	
Black coffee	£1.10	3	
Tea	£0.90	5	
		Total cost	

a Complete the table to show the total cost of the drinks.

Prices at the coffee shop will rise next week. The new prices are given below.

b Assuming I buy the same drinks, complete the table to show how much I will spend next week.

Drink	Price	Quantity bought	Cost
White coffee	£1.35	7	
Black coffee	£1.20	3	
Tea	£0.95	5	
		Total cost	

c To write the total cost next week as a percentage of the total cost last week, complete the following:

$$\frac{\text{total cost next week}}{\text{total cost last week}} \times 100 = \dots\dots\dots$$

### Think about...

This is **the fixed base Laspeyres index** for my drinks at the coffee shop.

The 'fixed base' in this name refers to the assumption that **the quantities bought remained the same** after the price change.

Do you think this will be the case?

How could the changes in price affect what I buy?

Do you think Laspeyres is an accurate index?

Can you think of any way of improving it?

Could you set up a spreadsheet to calculate Laspeyres index?

### Try this ... Task 2 Farmers' market

A shopper buys vegetables at a farmers' market each week.

The table gives the prices and quantities bought over a four week period.

Vegetable	Week 0		Week 1		Week 2		Week 3	
	Price (per kg)	Quantity (kg)	Price (per kg)	Quantity (kg)	Price (per kg)	Quantity (kg)	Price (per kg)	Quantity (kg)
Potatoes	£0.56	2.5	£0.57	5	£0.56	2.5	£0.58	2.5
Parsnips	£1.80	0.5	£1.82	0.6	£1.76	0.4	£1.85	0.3
Carrots	£0.60	0.4	£0.59	0.3	£0.54	0.5	£0.64	0.4
Sprouts	£1.32	0.5	£1.35	0.5	£1.36	0.4	£1.40	0.4
Broccoli	£1.75	0.6	£1.76	0.7	£1.76	0.6	£1.78	0.5

The Laspeyres index for the data from Week 0 to Week 3 is given by:

$$\left( \frac{\sum P_{i3}Q_{i0}}{\sum P_{i0}Q_{i0}} \right) \times 100 = \frac{0.58 \times 2.5 + 1.85 \times 0.5 + 0.64 \times 0.4 + 1.40 \times 0.5 + 1.78 \times 0.6}{0.56 \times 2.5 + 1.80 \times 0.5 + 0.60 \times 0.4 + 1.32 \times 0.5 + 1.75 \times 0.6} \times 100$$
$$= \frac{4.399}{4.25} \times 100 = 103.5058... = 103.5 \text{ (to 1 dp)}$$

This Laspeyres index suggests that the price of vegetables from the farmers' market increased by 3.5% between Week 0 and Week 3.

Calculate the Laspeyres index for the data:

- a from Week 0 to Week 1
- b from Week 0 to Week 2

### Think about...

Can you explain why an index of 103.5 means that the price increase from week 0 to week 3 is 3.5%?

What do your answers to parts **a** and **b** tell you about price rises and price falls during those time periods?

Why might a fixed base Laspeyres index not give a good indication of changes in the cost of vegetables to the shopper over a period of 6 months?

### Try this ... Task 3 DVD sales

The table below shows data relating to the sale of two types of DVDs (with quantities rounded to the nearest hundred) sold by a supermarket.

	Month 0		Month 1		Month 3	
	Average price	Quantity	Average price	Quantity	Average price	Quantity
<b>Films</b>	£10	1500	£12	1200	£8	1550
<b>TV series</b>	£16	900	£18	600	£14	800

Calculate a fixed-base Laspeyres index for the data:

- a** from Month 0 to Month 1
- b** from Month 0 to Month 2

#### Think about...

What do your answers to parts **a** and **b** tell you about price rises and price falls during those time periods?

Which of your results is likely to be the most accurate, and why?

Can you give any reasons as to why prices changed so much during the time periods?

### Extension: Personal Inflation Calculator

The Consumer Prices Index (CPI) and Retail Prices Index (RPI) are used by the government to measure inflation. In each case the total cost of a fixed 'basket of goods and services' is calculated and used each month to calculate a Laspeyres index.

Changes in spending patterns are allowed for by updating what is in the basket of goods and services each year. However different people spend their money in different ways, so the CPI and RPI may not give a good indication of how changing prices affect you.

To find how inflation affects you personally, you can record the prices and quantities of those things you buy regularly and calculate a personal fixed base Laspeyres index.