## Two years, two goods. Example of price indexes

$P_{1}^{H}$ Price of hats in first year $\quad Q_{1}^{H}$ Quantity of hats in first year
$P_{1}^{C}$ Price of cigarettes in first year $\quad Q_{1}^{C}$ Quantity of cigarettes in first year
Second year values are subscripted " 2 ".

Cost (revenue) using current prices
First year $\quad=P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}$
Second year $=P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}$

Price index using quantities from first year
Two steps

1) Calculate cost (revenue) using current prices but using first year's quantities for both years

First year $\quad=P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}$

Second year $=P_{2}^{H} \times Q_{1}^{H}+P_{2}^{C} \times Q_{1}^{C}$
2) Pick a base year. Then divide each cost (revenue) number by the value in the base year.
a) Using first year as base year

Price index number

First year

$$
\begin{aligned}
& =\left(P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}\right) /\left(P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}\right)=1 \\
& =\left(P_{2}^{H} \times Q_{1}^{H}+P_{2}^{C} \times Q_{1}^{C}\right) /\left(P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}\right)
\end{aligned}
$$

Second year

Notice: index number is equal to 1 in the base year, the first year.
b) Using second year as base year

## Price index number

First year

$$
=\left(P_{1}^{H} \times Q_{1}^{H}+P_{1}^{C} \times Q_{1}^{C}\right) /\left(P_{2}^{H} \times Q_{1}^{H}+P_{2}^{C} \times Q_{1}^{C}\right)
$$

Second year

$$
=\left(P_{2}^{H} \times Q_{1}^{H}+P_{2}^{C} \times Q_{1}^{C}\right) /\left(P_{2}^{H} \times Q_{1}^{H}+P_{2}^{C} \times Q_{1}^{C}\right)=1
$$

Notice: index number is equal to 1 in the second year, the base year.

Price index using quantities from second year
Two steps

1) Calculate cost (revenue) using current prices but using second year's quantities for both years

First year $\quad=P_{1}^{H} \times Q_{2}^{H}+P_{1}^{C} \times Q_{2}^{C}$

Second year $=P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}$
2) Pick a base year. Then divide each cost (revenue) number by the value in the base year.
a) Using first year as base year

Price index number

First year

$$
=\left(P_{1}^{H} \times Q_{2}^{H}+P_{1}^{C} \times Q_{2}^{C}\right) /\left(P_{1}^{H} \times Q_{2}^{H}+P_{1}^{C} \times Q_{2}^{C}\right)=1
$$

Second year $\quad=\left(P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}\right) /\left(P_{1}^{H} \times Q_{2}^{H}+P_{1}^{C} \times Q_{2}^{C}\right)$
Notice: index number is equal to 1 in the base year, the first year.
b) Using second year as base year

Price index number
First year $\quad=\left(P_{1}^{H} \times Q_{2}^{H}+P_{1}^{C} \times Q_{2}^{C}\right) /\left(P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}\right)$

Second year

$$
=\left(P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}\right) /\left(P_{2}^{H} \times Q_{2}^{H}+P_{2}^{C} \times Q_{2}^{C}\right)=1
$$

Notice: index number is equal to 1 in the second year, the base year.

## Averaging the two price indexes using a geometric average

$I_{1}^{1 s t Y r Q s}$ Value of index made from first year quantities, in the first year
$I_{2}^{1 s t Y r Q s}$ Value of index made from first year quantities, in the second year
$I_{1}^{2 n d Y r Q s}$ Value of index made from second year quantities, in the first year
$I_{2}^{2 n d Y r Q s}$ Value of index made from second year quantities, in the second year

## Combined price index number

First year $=\sqrt{I_{1}^{1 s t Y r Q s} \times I_{1}^{2 n d Y r Q s}}$
Second year $=\sqrt{I_{2}^{1 s t Y r Q s} \times I_{2}^{2 n d Y r Q s}}$

Note: in the base year, the value of both of the component price indexes will be one.
So the value of the combined price index number will also be one in the base year.

