

Implicit and Explicit Price Indexes Compared

TheoryGuru applied to Chicago Price Theory

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Setup

```
In[ ]:= Get["http://economicreasoning.com"]
```

Proof & Logic Tools 6.3

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Type ERCommands for a list of commands in the package.

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In the Wolfram Language, $x.y$ refers to the tensor DOT PRODUCT, NOT scalar multiplication. For TheoryGuru purposes, tensor means vector, so that the result of $x.y$ is a scalar.

Expenditure growth factor

```
In[2]:= efact =  $\frac{p2.q2}{p1.q1}$ ;
```

Inflation factors

```
In[3]:= pfactLaspeyres =  $\frac{p2.q1}{p1.q1}$ ;
```

```
pfactPaasche =  $\frac{p2.q2}{p1.q2}$ ;
```

Quantity growth factors

$$\begin{aligned} \text{In[5]:= } \text{qfactLaspeyres} &= \frac{p1 \cdot q2}{p1 \cdot q1}; \\ \text{qfactPaasche} &= \frac{p2 \cdot q2}{p2 \cdot q1}; \end{aligned}$$

Squared Fisher factors (i.e., Fisher ideal index is a square root)

$$\begin{aligned} \text{In[7]:= } \text{pfactFishersq} &= \text{pfactLaspeyres pfactPaasche}; \\ \text{qfactFishersq} &= \text{qfactLaspeyres qfactPaasche}; \end{aligned}$$

Results

The implicit price index $\left(\frac{\text{Expenditure}}{\text{Quantity Index}} \right)$ is the same as the price index if one is Laspeyres and the other is Paasche

$$\begin{aligned} \text{In[*]:= } \text{efact} &== \text{pfactLaspeyres qfactPaasche} == \text{pfactPaasche qfactLaspeyres} \\ \text{Out[*]= } &\text{True} \end{aligned}$$

The implicit price index can be different from the price index, in which case the Laspeyres price index differs from the Paasche

$$\begin{aligned} \text{In[*]:= } \text{TheoryGuru} &[\{\text{efact} \neq \text{pfactLaspeyres qfactLaspeyres}\}, \\ &\text{pfactLaspeyres} \neq \text{pfactPaasche}] \\ \text{Out[*]= } &\text{True} \end{aligned}$$

$$\begin{aligned} \text{In[11]:= } \text{TheoryGuru} &[\{\text{efact} \neq \text{pfactPaasche qfactPaasche}, \text{qfactPaasche} > 0\}, \\ &\text{pfactLaspeyres} \neq \text{pfactPaasche}] \\ \text{Out[*]= } &\text{True} \end{aligned}$$

Based on the Fisher ideal index, the implicit price index (its square is $\frac{\text{efact efact}}{\text{qfactFishersq}}$) is the same as the price index

$$\begin{aligned} \text{In[*]:= } \text{efact efact} &== \text{pfactFishersq qfactFishersq} \\ \text{Out[*]= } &\text{True} \end{aligned}$$

Variable interpretations