§ 3D/3E: Index Numbers and Deception with Numbers

Index Numbers: Compares measurements made at different times or in different places. One time or place is chosen as the reference value. The index number is then:

$$\text{Index Number} = \frac{\text{Value}}{\text{Ref. Value}} \times 100$$

Ex: Finding an index number:

Suppose the cost of a service in 1990 was \$10 and the cost of the same service in 2003 was \$15. Use the 1990 value as the reference and determine the index number.

Solution:

$$IN = \frac{\$15}{\$10} \times 100 = \frac{3}{2} \times 100 = 150$$

The index number is 150, saying the new price is 150% of the 2003 price.

There is no particular reason why we chose 1990 as the reference value. You can use a different reference value. Realize that this changes the index number.

The CPI is computed monthly, representing an average of prices for sample goods and services. The CPI takes inflation/deflation into account.

Look at p. 190 Table 3.4

Use the CPI to do the following:

Ex: How much higher were typical prices in 2005 than in 1973?

Solution: We solve this by division, just like in the previous example.

$\frac{CPI_{2005}}{CPI_{1973}} = \frac{195.3}{44.4} \approx 4.4$

Thus, the typical price in 2005 was 4.4 x those in 1923. This translates to about 340% higher cost in 2005.

Ex: How much higher were typical prices in 2005 when compared with prices in 2003?

Solution: $\frac{CPI_{2005}}{CPI_{2003}} = \frac{195.3}{184.0} \approx 1.06$

or 6% higher in 2005 than in 2003

Calculating inflation/deflation between years.

The rate of inflation from one year to the next is defined (usually) as the relative change in the CPI.

Ex. Calculate the inflation rate from 1989 to 2003

Solution:

$$IR = \frac{CPI_{2003} - CPI_{1989}}{CPI_{1989}} = \frac{184 - 124}{124} = .48$$

which is 48%

How do we adjust prices for inflation?

Given the cost in USD for year X, the same price/cost in USD for year Y is given by:

$$\text{Price in Year Y} = (\text{Price in year X}) \times \frac{CPI_Y}{CPI_X}$$

Ex: Suppose in 2005 you had a salary of 50,000 USD. How much is this in 1985 USD?

Solution:

$$\text{price in 1985} = (\text{Price in 2005}) \times \frac{CPI_{1985}}{CPI_{2005}}$$

$$= 50{,}000\,\text{USD}_{2005} \times \frac{107.6}{195.3} \approx$$

$$27{,}500\,\text{USD}_{1985}$$

§3E Deception With Numbers

Simpson's Paradox. How you divide sets into groups can influence the results of analysis on those sets.

This is best illustrated with examples: