Price Indices and Real versus Nominal Values

Real versus Nominal Values

Prices in an economy do not stay the same. Over time the price level changes (i.e., there is inflation or deflation). A change in the price level changes the value of economic measures denominated in dollars. Values that increase or decrease with the price level are called *nominal* values. *Real* values are adjusted for price changes. That is, they are calculated as though prices did not change from the base year. For example, gross domestic product (GDP) is used to measure fluctuations in output. However, since GDP is the *dollar value* of goods and services produced in the economy, it increases when prices increase. This means that nominal GDP increases with inflation and decreases with deflation. But when GDP is used as a measure of short-run economic growth, we are interested in measuring increases or decreases in *output*, not prices. That is why real GDP is a better measure of economic performance—real GDP takes out the effects of price changes and allows us to isolate changes in output. Price indices are used to adjust for price changes. They are used to convert nominal values into real values.

Calculating Price Indices

The first step in converting nominal values to real values is to create a price index. A price index compares the total cost of a fixed market basket of goods in different years. The total cost of the market basket is found by multiplying the price of each item in the basket by the quantity of the item in the basket and then summing the results for all items. The cost of the market basket in the current year is then divided by the cost of the basic market basket in the base year as shown below:

$$\text{Price index} = \frac{\text{current-year cost}}{\text{base-year cost}} \times 100.$$

Multiplying by 100 allows comparison of the index in each year to the base-year index value of 100. The base year always has an index number of 100 since the current-year cost and the base-year cost of the market basket are the same in the base year.

The Consumer Price Index (CPI) is a commonly used price index that measures the price of a market basket of consumer goods. The following example shows how the CPI can be used to measure inflation.

Assume an average consumer buys only three items, as shown in Table 2-4.1.

Table 2-4.1
Prices of Three Goods Compared with Base-Year Price

	Quantity bought in base year	Unit price in base year	Spending in base year	Unit price in Year 1	Spending in Year 1	Unit price in Year 2	Spending in Year 2
Whole pizza	30	$5.00		$7.00		$9.00	
Flash drive	40	$6.00		$5.00		$4.00	
Six-pack of soda	60	$1.50		$2.00		$2.50	
Total	–	–		–		–	

Fill in the blanks in Table 2-4.1.

1. How much would $100 of goods and services purchased in the base year cost in Year 1?

2. What was the percentage increase in prices in this case? Show your calculations.

   The rate of change in this index is determined by looking at the percentage change from one year to the next. If, for example, the CPI were 150 in one year and 165 the next, then the year-to-year percentage change is 10 percent. You can compute the change using this formula:

$$\text{Percent change} = \frac{\text{change in CPI}}{\text{beginning CPI}} \times 100.$$

3. What is the percentage increase in prices from the base year to Year 2? _____

Table 2-4.2
Constructing a Price Index

		Year 1		Year 2		Year 3	
Basic market basket item	No. of units	Price per unit	Cost of market basket	Price per unit	Cost of market basket	Price per unit	Cost of market basket
Cheese	2 lbs.	$1.75	$3.50	$1.50	$3.00	$1.50	$3.00
Blue jeans	2 pair	$12.00	$24.00	$15.50		$20.00	$40.00
Gasoline	10 gals.	$1.25	$12.50	$1.60	$16.00	$2.70	
Total	–	–	$40.00	–	$50.00	–	

Fill in the blanks in Table 2-4.2.

4. If Year 2 is selected as the base year, calculate the price index for each year. Show your work.

   (A) Year 1 = _____

   (B) Year 2 = _____

   (C) Year 3 = _____

5. These price indices indicate that there was a 40 percent increase in prices between Year 2 and Year 3.

   (A) What is the percentage increase between Year 1 and Year 2?_____.

   (B) What is the percentage increase between Year 1 and Year 3?_____.

Converting Nominal GDP to Real GDP

To use GDP to measure output growth, it must be converted from nominal to real. Let's say nominal GDP in Year 1 is $1,000 and in Year 2 it is $1,100. Does this mean the economy has grown 10 percent between Year 1 and Year 2? Not necessarily. If prices have risen, part of the increase in nominal GDP in Year 2 will represent the increase in prices. GDP that has been adjusted for price changes is called *real* GDP. If GDP isn't adjusted for price changes, we call it *nominal* GDP.

To compute real GDP in a given year, use the following formula:

$$\text{Real GDP} = \text{nominal GDP}/(\text{price index}/100).$$

To compute real output growth in GDP from one year to another, subtract real GDP for Year 2 from real GDP in Year 1. Divide the answer (the change in real GDP from the previous year) by real GDP in Year 1. The result, multiplied by 100, is the percentage growth in real GDP from Year 1 to Year 2. (If real GDP declines from Year 1 to Year 2, the answer will be a negative percentage.) Here's the formula:

$$\text{Output growth} = \frac{(\text{real GDP in Year 2} - \text{real GDP in Year 1})}{\text{real GDP in Year 1}} \times 100.$$

For example, if real GDP in Year 1 = $1,000 and in Year 2 = $1,028, then the output growth rate from Year 1 to Year 2 is 2.8%: (1,028 – 1,000) / 1,000 = .028, which we multiply by 100 in order to express the result as a percentage.

To understand the impact of output changes, we usually look at real GDP per capita. To do so, we divide the real GDP of any period by a country's average population during the same period. This procedure enables us to determine how much of the output growth of a country simply went to supply the increase in population and how much of the growth represented improvements in the standard of living of the entire population. In our example, let's say the population in Year 1 was 100 and in Year 2 it was 110. What was real GDP per capita in Years 1 and 2?

Year 1

$$\text{Real GDP per capita} = \frac{\text{Year 1 real GDP}}{\text{population in Year 1}} = \frac{\$1{,}000}{100} = \$10.$$

Year 2

$$\text{Real GDP per capita} = \frac{\$1{,}028}{110} = \$9.30.$$

In this example, real GDP per capita fell even though output growth was positive. Developing countries with positive output growth but high rates of population growth often experience this condition.

Use the information in Table 2-4.3 to answer the following questions.

Table 2-4.3
Nominal and Real GDP

	Nominal GDP	Price index	Population
Year 3	$5,000	125	11
Year 4	$6,600	150	12

6. What is the real GDP in Year 3? _____

7. What is the real GDP in Year 4? _____

8. What is the real GDP per capita in Year 3? _____

9. What is the real GDP per capita in Year 4? _____

10. What is the rate of real output growth between Years 3 and 4? _____

11. What is the rate of real output growth per capita between Years 3 and 4? _____
(*Hint:* Use per capita data in the output growth rate formula.)