

Module B. Consumer Price Index and Measurement of Inflation

Note: This feature provides supplementary analysis for the material in Part 2 of *Common Sense Economics*, particularly Element 5 on the importance of monetary and price stability as a source of economic progress.

When tracking the path of income, wages, and prices of various goods and services through time, it is important to adjust for changes in the general level of prices. Economists use the term “inflation” when referring to increases in the general level of prices. Price indexes are used to track the general price level and measure inflation. The term “real” is used to indicate that income and other figures have been adjusted for the effects of inflation. Thus, when you see terms like “real income” or “real wages,” this simply means that the figures have been adjusted for changes in the general level of prices across time. When comparing data at different points in time, it is nearly always the real changes that are of most interest.

What precisely is a price index, and how can it be used to adjust income and other figures for the effects of inflation? *A price index measures the cost of purchasing a market basket (or “bundle”) of goods and services at a point in time relative to the cost of purchasing the identical market basket during an earlier reference period.* A base year (or period) is chosen and assigned a value of 100. As prices increase and the cost of purchasing the reference bundle of goods and services rises relative to the base year, the price index increases proportionally. Thus, a price index of 110 in one year indicates that the general level of prices is 10 percent ($110 - 100$) higher than during the base period of 100. An index of 120 implies 20 percent higher prices than the base period, and so on.

The most commonly used price index is the Consumer Price Index, or CPI. *The consumer price index is designed to measure the impact of price changes on the cost of the typical bundle of goods and services purchased by households.* A bundle of 211 items that constitute the “typical bundle” purchased by urban consumers during the 1982–1984 base period provides the foundation for the CPI. The quantity of each good or service reflects the quantity actually purchased by the typical urban household during the base period.

Every month, the Bureau of Labor Statistics surveys approximately 26,400 stores representative of the urban United States to derive the average price for each of the food items, consumer goods and services, housing, and property taxes included in the index. The cost of purchasing this 211-item market basket at current prices is then compared to the cost of purchasing the same market basket at base-year prices. If the cost of purchasing the basket during a period is greater than during the 1982-1984 base period, the CPI will be proportionally greater

than 100. This indicates how much higher the general level of prices in the specified period is relative to the base. Correspondingly, a CPI of less than 100 would indicate that the general level of prices was less than during the base period.

The result is a measure of current prices compared to 1982–1984 base-period prices. In November 2015 the value of the CPI was 237, compared to the 100 of the 1982–1984 base period. This indicates that the price level of the representative basket in November 2015 was 137 percent higher than the price level of the same goods and services during the 1982–1984 period.

The Calculation of the Inflation Rate

The annual inflation rate is simply the percentage change from one year to the next in the general level of prices. The CPI is commonly used to calculate the rate of inflation. The inflation rate is equal to:

$$\text{Inflation Rate (\%)} = \frac{\text{CPI in Period 2} - \text{CPI in Period 1}}{\text{CPI in Period 1}} \times 100$$

If the price index this year was 210, compared to 200 last year, for example, the inflation rate would equal 5 percent (210 minus 200 divided by 200; this ratio is then multiplied by 100 in order to present it in percent form.)

Adjusting for Price Changes Across Time

The CPI data across time periods can be used to adjust for changes in the general level of prices. In some cases, we would like to compare current income or other nominal figures with those of an earlier period when the general level of prices was different. For example, suppose you earned \$40,000 in 2015 and you wanted to know how much your father would have had to earn during 1983 to have had the same purchasing power as you had with your \$40,000 income in 2015. In order to convert nominal figures of a later period to the purchasing power of an earlier year, you merely deflate the later figures by multiplying them by the ratio of the CPI in the earlier period divided by the CPI of the later period. Thus, if the CPI was 100 in 1983 and 237 in 2015, you could multiply your \$40,000 income of 2015 by 100 divided by 237 in order to derive the 1983 income equivalent to your \$40,000 of 2015. This figure would be \$16,878. Thus, because of the lower level of prices in 1983, \$16,878 income in that year had the same purchasing power as \$40,000 in 2015.

While the CPI data can be used to place nominal figures of a later period into the purchasing power of an earlier period, sometimes it makes sense to make past comparisons in terms of the current general level of prices. The CPI data can also be used to accomplish this task. To convert an earlier observation to current dollars, just multiply the observation by the CPI during the current period divided by the CPI during the earlier period. If prices have risen in recent years, this will “inflate” the data for the earlier year and thereby bring it into line with the current purchasing power of the dollar.

Let’s illustrate this point and at the same time analyze the changes in gasoline prices during the last several decades. In recent years, the media has often reported that gas prices rose to new highs and then fell. In nominal terms this was indeed the case, but what about the real price of gasoline?

Table 1 presents data for the nominal or current price (column 1) of a gallon of unleaded regular gasoline for various years since 1973. The parallel data for the consumer price index (CPI) are presented in column 2. The nominal price of gasoline in 1973 was 39 cents. To convert this figure to the purchasing power of the dollar in November 2015, one merely multiplies the 39 cents by the ratio of the CPI in November 2015 divided by the CPI in 1973. This real price (shown in column 3), measured in terms of the 2015 price level, is equal to \$2.08 (0.39 times 5.3, the ratio of 237.3/44.4).

Table 1: Price of a Gallon of Regular Unleaded Gasoline

Year	Nominal Price (1)	CPI (1982–84 = 100) (2)	Real Price (3)
1973	\$0.39	44.4	\$2.08
1976	\$0.61	56.9	
1980	\$1.25	82.4	\$3.60
1985	\$1.20	107.6	
1990	\$1.16	130.7	
1995	\$1.15	152.4	
2000	\$1.51	172.2	\$2.08
2005	\$2.30	195.3	
2010	\$2.78	218.1	
2015 (Nov.)	\$2.16	237.3	\$2.16

Source: U.S. Energy Information Administration, *Monthly Energy Review* The data for regular unleaded gasoline were unavailable prior to 1976. Thus, the 1973 observation is for regular leaded gasoline, which was slightly cheaper during that period.

Both crude oil prices and gasoline prices rose sharply throughout the 1970s. By 1980, the nominal price of gasoline had risen to \$1.25. This would make the real price of gasoline measured in 2015 dollars equal to \$3.60 ($\1.25×2.9, the ratio of $237.3/82.4$), even higher than the price in 2015.

Exercise A: Use of CPI data to calculate the rate of inflation

Table 2: Consumer Price Index		
Year	Index (1982-84 = 100)	Annual Percent Change
2010	218.1	---
2011	224.9	
2012	229.6	
2013	233.0	
2014	236.7	
2015	237.3	

1. What was the annual rate of inflation during 2012? What was the annual rate of inflation during 2015?
2. How much higher was the general level of prices in 2015 than 2010? How much higher were prices in 2015 than during the 1982-1984 base year?
3. How does unanticipated inflation in the U.S. negatively impact the economy? Consider its impact on people living on fixed incomes, business investments and the amount exported from and imported to the U.S.

Exercise B: Placing data from an earlier period into the price level of a later period.

Use Table 1 to answer the following questions:

1. Measured in terms of the general level of prices in November of 2015, derive the real price of a gallon of gasoline for the years 1976, 1985, 1990, 1995, 2005, and 2010. Show your calculations.
2. Was the real price of a gallon of gas higher in November 2015 than in 1980? Was the real price of gas higher in November 2015 than in 1973? Why would you want to convert current prices into real prices when making comparisons over time?

The answer key is available to instructors who adopt Common Sense Economics (St. Martin's Press). Details on how to adopt are provided at:
<http://commonsenseeconomics.com/adopt>

Additional Resources on the Consumer Price Index

1. [The Consumer Price Indexes \(CPI\) program of The United States Bureau of Labor Statistics](#) provides monthly data on changes in the prices paid by urban consumers for a representative basket of goods and services. This site also provides information on the goods and services included in the CPI representative market basket and additional details on the CPI.
2. For data on the CPI, visit [CPI-U from 1913 to present \(Base year is chained; 1982-84 = 100\)](#). Instructors may want to display this data to complement a basic lecture on the CPI.
3. [Economic Research Federal Reserve Bank of St. Louis](#) offers advanced instructional tools. Instructors can plot the CPI data in various formats (levels, percent change from year ago, percent change annualized, with recessions identified in a time series, seasonally adjusted, not seasonally adjusted, with all items, with all items less energy or food or both). The CPI data can also be downloaded here. This is a powerful instructional tool.