

MEASURING THE COST OF LIVING

WHAT'S NEW IN THE SEVENTH EDITION:

A new *In the News* feature on “Monitoring Inflation in the Internet Age” has been added.

LEARNING OBJECTIVES:

By the end of this chapter, students should understand:

- ☐ how the consumer price index (CPI) is constructed.
- ☐ why the CPI is an imperfect measure of the cost of living.
- ☐ how to compare the CPI and the GDP deflator as measures of the overall price level.
- ☐ how to use a price index to compare dollar figures from different times.
- ☐ the distinction between real and nominal interest rates.

CONTEXT AND PURPOSE:

It is very important that students understand how to make these calculations. Students often have a difficult time recreating the steps taken in class when the instructor demonstrates them. Several periods of the Substory (especially during the 1980s as computers and DVD players) have fallen over 100%.

Example again:

Year	Price of Year 1 Basket	Price of Basketballs
Year 1	\$10	\$12
Year 2	14	18

Value in 2012 dollars = 1982 salary \times (CPI in 2012/CPI in 1982)

Value in 2012 dollars = $\$15,000 \times (229.5/96.5) = \$35,674$

3. Compute the Cost of the Basket:
 - Cost in Year 1 = $(3 \times \$10) + (4 \times \$12) = \$78$
 - Cost in Year 2 = $(3 \times \$12) + (4 \times \$15) = \$96$
 - Cost in Year 3 = $(3 \times \$14) + (4 \times \$18) = \$114$
4. Using Year 1 as the base year, compute the index:
 - CPI in Year 1 = $(\$78/\$78) \times 100 = 100$
 - CPI in Year 2 = $(\$96/\$78) \times 100 = 123.08$
 - CPI in Year 3 = $(\$114/\$78) \times 100 = 146.15$
5. Compute the inflation rate.
 - The consumer price index (CPI) shows the cost of a basket of goods and services relative to the cost of the same basket in the base year. The index is used to measure the overall level of prices in the economy. The percentage change in the consumer price index measures the inflation rate.
 - Inflation rate for Year 2 = $[(123.08 - 100)/100] \times 100 = 23.08\%$
 - Inflation rate for Year 3 = $[(146.15 - 123.08)/123.08] \times 100 = 18.74\%$
 - The consumer price index is an imperfect measure of the cost of living for three reasons. First, it does not take into account consumers' ability to substitute toward goods that become relatively cheaper over time. Second, it does not take into account increases in the purchasing power of the dollar due to the introduction of new goods. Third, it is distorted by unmeasured changes in the quality of goods and services.

Because of these measurement problems, the CPI overstates true inflation.

- Like the consumer price index, the GDP deflator measures the overall level of prices in the economy. The two price indexes usually move together, but there are important differences. The GDP deflator differs from the CPI because it includes goods and services produced rather than goods and services consumed. As a result, imported goods affect the consumer price index but not the GDP deflator. In addition, while the consumer price index uses a fixed basket of goods, the GDP deflator automatically changes the group of goods and services over time as the composition of GDP changes.
- Dollar figures from different times do not represent a valid comparison of purchasing power. To compare a dollar figure from the past to a dollar figure today, the older figure should be inflated using a price index.
- Various laws and private contracts use price indexes to correct for the effects of inflation. The tax laws, however, are only partially indexed for inflation.
- A correction for inflation is especially important when looking at data on interest rates. The nominal interest rate is the interest rate usually reported; it is the rate at which the number of dollars in a savings account increases over time. By contrast, the real interest rate takes into account changes in the value of the dollar over time. The real interest rate equals the nominal interest rate minus the rate of inflation.

CHAPTER OUTLINE:

I. The Consumer Price Index

A. Definition of **consumer price index (CPI)**: a measure of the overall cost of the goods and services bought by a typical consumer.

B. How the Consumer Price Index Is Calculated

1. Fix the basket.

a. The Bureau of Labor Statistics uses surveys to determine a representative bundle of goods and services purchased by a typical consumer.

b. Example: 4 hot dogs and 2 hamburgers.

2. Find the prices.

a. Prices for each of the goods and services in the basket must be determined for each time period.

b. Example:

Year	Price of Hot Dogs	Price of Hamburgers
2013	\$1	\$2
2014	\$2	\$3
2015	\$3	\$4

3. Compute the basket's cost.

a. By keeping the basket the same, only prices are being allowed to change. This allows us to isolate the

effects of price changes over time.

b. Example:

$$\text{Cost in 2013} = (\$1 \times 4) + (\$2 \times 2) = \$8.$$

$$\text{Cost in 2014} = (\$2 \times 4) + (\$3 \times 2) = \$14.$$

$$\text{Cost in 2015} = (\$3 \times 4) + (\$4 \times 2) = \$20.$$



Type: Take-home assignment
Topics: Consumer price index
Class limitations: Works in any size class

Purpose

This assignment gives students a practical look at how price indices are measured. It also establishes base prices for calculating inflation rates later in the term.

Instructions

The students should pick real transaction prices for goods they actually purchase. If the indices will be used to calculate inflation rate, they should save a copy of this assignment in a safe place. They should not use prices from catalogs because such prices will not be subject to much change over the semester.

Points for Discussion

This assignment makes a good introduction to a discussion of market basket selection for price indices. The goods that students usually pick for their market basket account for a relatively small portion of consumer spending compared to housing, medical care, transportation, etc. Ask the students which goods are likely to change price frequently.

This can be used to introduce problems with the measurement of the consumer price index.

Assignment

The consumer price index includes the prices of hundreds of goods purchased by consumers. It is possible to construct many other price indexes.

Your mission: Create a personalized student price index.

1. Choose five (or more) different products.
— be specific e.g., unleaded gasoline, Budweiser beer
2. Pick a quantity for each product. This will be your market basket.
— e.g., 15 gallons gasoline, 12 pack of Budweiser
3. Find the actual price for each product.
4. Calculate the total cost of buying these products.

At the end of the semester, have students find the prices for these same five products and recalculate the cost of their market basket. Then, have the students calculate their SPI (Student Price Index) and the rate of inflation.

4. Choose a base year and compute the index.
 - a. The base year is the benchmark against which other years are compared.
 - b. The formula for calculating the price index is:

$$CPI = \left(\frac{\text{Price of basket in current year}}{\text{Price of basket in base year}} \right) \times 100$$

- c. Example (using 2013 as the base year):

$$\text{CPI for 2013} = (\$8)/(\$8) \times 100 = 100.$$

$$\text{CPI for 2014} = (\$14)/(\$8) \times 100 = 175.$$

$$\text{CPI for 2015} = (\$20)/(\$8) \times 100 = 250.$$



5. Compute the inflation rate.

- a. Definition of **inflation rate**: the percentage change in the price index from the preceding period.



- b. The formula used to calculate the inflation rate is:

$$\text{Inflation rate in year 2} = \frac{\text{CPI in year 2} - \text{CPI in year 1}}{\text{CPI in year 1}} \times 100$$

- c. Example:

$$\text{Inflation Rate for 2014} = (175 - 100)/100 \times 100 = 75\%.$$

$$\text{Inflation Rate for 2015} = (250 - 175)/175 \times 100 = 43\%.$$



C. The Producer Price Index

1. Definition of **producer price index (PPI)**: a **measure of the cost of a basket of goods and services bought by firms.**
2. Because firms eventually pass on higher costs to consumers in the form of higher prices on products, the producer price index is believed to be useful in predicting changes in the CPI.

D. *FYI: What is in the CPI's Basket?*

1. Figure 1 shows the makeup of the market basket used to compute the CPI.
2. The largest category is housing, which makes up 41% of a typical consumer's budget.



E. Problems in Measuring the Cost of Living

1. Substitution Bias
 - a. When the price of one good changes, consumers often respond by substituting another good in its place.
 - b. The CPI does not allow for this substitution; it is

calculated using a fixed basket of goods and services.

- c. This implies that the CPI overstates the increase in the cost of living over time.

2. Introduction of New Goods

- a. When a new good is introduced, consumers have a wider variety of goods and services from which to choose.
- b. This makes every dollar more valuable, which lowers the cost of maintaining the same level of economic well-being.
- c. Because the market basket is not revised often enough, these new goods are left out of the bundle of goods and services included in the basket.

3. Unmeasured Quality Change

- a. If the quality of a good falls from one year to the next, the value of a dollar falls; if quality rises, the value of the dollar rises.
- b. Attempts are made to correct prices for changes in quality, but it is often difficult to do so because quality is hard to measure.

4. The size of these problems is also difficult to measure.

5. Many economists believe that the CPI overstates the rate of inflation by approximately one-half percentage

point per year.

6. The issue is important because many government transfer programs (such as Social Security) are tied to increases in the CPI.

F. *In the News: Monitoring Inflation in the Internet Age*

1. The internet provides different ways to collect data on the overall price level.
2. This article from *Slate* describes some new price indices that take advantage of information available on the web.

G. The GDP Deflator versus the Consumer Price Index

1. The GDP deflator reflects the prices of all goods produced domestically, while the CPI reflects the prices of all goods bought by consumers.
2. The CPI compares the prices of a *fixed* basket of goods over time, while the GDP deflator compares the prices of the goods *currently produced* to the prices of the goods produced in the base year. This means that the group of goods and services used to compute the GDP deflator changes automatically over time as output changes.
3. Figure 2 shows the inflation rate as measured by both the CPI and the GDP deflator.

II. Correcting Economic Variables for the Effects of Inflation

A. Dollar Figures from Different Times

1. To change dollar values from one year to the next, we can use this formula:

2. Example: Babe Ruth's 1931 salary in 2012 dollars:

$$\text{Salary in 2012 dollars} = \text{Salary in 1931 dollars} \times \frac{\text{Price level in 2012}}{\text{Price level in 1931}}$$

$$\text{Salary in 2012 dollars} = \$80,000 \times (229.5/15.2).$$

$$\text{Salary in 2012 dollars} = \$1,207,894.$$

3. *FYI: Mr. Index Goes to Hollywood*

- a. Reports of box office success are often made in terms of the dollar values of ticket sales.

- b. These ticket sales are then compared with ticket sales of movies in the past.
- c. However, no corrections for changes in the value of a dollar are made.

Activity 2—You Paid How Much?

Type: Take-home assignment
Topics: Consumer price index
Class limitations: Works in any size class

Purpose

This assignment gives students a chance to see how dollar values have changed over time. It also provides them some practice at using the formula to calculate changes in dollar values over time.

Instructions

Have students ask their parents (or grandparents) how much they paid for their first car and in what year they bought it. (If there are older students in the class, ask them to remember how much they paid for their first car.) Students can then determine how much they would have to pay in current dollars using the consumer price index.

B. Indexation

1. Definition of **indexation**: the automatic correction of a dollar amount for the effects of inflation by law or contract.

2. As mentioned above, many government transfer programs use indexation for the benefits. The government also indexes the tax brackets used for federal income tax.
3. There are uses of indexation in the private sector as well. Many labor contracts include cost-of-living allowances (COLAs).

C. Real and Nominal Interest Rates



1. Example: Sally Saver deposits \$1,000 into a bank account that pays an annual interest rate of 10%. A year later, she withdraws \$1,100.
2. What matters to Sally is the *purchasing power* of her money.
 - a. If there is zero inflation, her purchasing power has risen by 10%.
 - b. If there is 6% inflation, her purchasing power has risen by about 4%.
 - c. If there is 10% inflation, her purchasing power has remained the same.
 - d. If there is 12% inflation, her purchasing power has

declined by about 2%.

- e. If there is 2% deflation, her purchasing power has risen by about 12%.
- 3. Definition of **nominal interest rate**: the interest rate that measures the change in dollar amounts.
- 4. Definition of **real interest rate**: the interest rate corrected for inflation.

5. *Case Study: Interest Rates in the U.S. Economy*

- a. Figure 3 shows real and nominal interest rates from 1965 to the present.
- b. The nominal interest rate is always greater than the real interest rate in this diagram because there was always inflation during this period.
- c. Note that in the late 1970s the real interest rate was negative because the inflation rate exceeded the nominal interest rate.

SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. The consumer price index measures the overall cost of the goods and services bought by a typical consumer. It is constructed by surveying consumers to determine a basket of goods and services that the typical consumer buys. Prices of these goods and services are used to compute the cost of the basket at different times, and a base year is chosen. To compute the index, we divide the cost of the market basket in the current year by the cost of the market basket in the base year and multiply by 100.

The CPI is an imperfect measure of the cost of living because of (1) substitution bias, (2) the introduction of new goods, and (3) unmeasured quality changes.

2. Since Henry Ford paid his workers \$5 a day in 1914 and the consumer price index was 10 in 1914 and 230 in 2012, then the Ford paycheck was worth $\$5 \times 230 / 10 = \115 a day in 2012 dollars.

Questions for Review

1. A 10% increase in the price of chicken has a greater effect on the consumer price index than a 10% increase in the price of caviar because chicken is a bigger part of the average consumer's market basket.
2. The three problems in the consumer price index as a measure of the cost of living are: (1) substitution bias, which arises because people substitute toward goods that have become relatively less expensive; (2) the introduction of new goods, which are not reflected

quickly in the CPI; and (3) unmeasured quality change.

3. If the price of imported French wine rises, there is little effect on the consumer price index, because alcoholic beverages account for only 1 percent of the CPI's basket. But the GDP price index is not affected at all, because imported French wine is not produced domestically so it is not included in GDP.
4. Because the overall price level doubled, but the price of the candy bar rose sixfold, the real price (the price adjusted for inflation) of the candy bar tripled.
5. The nominal interest rate is the rate of interest paid on a loan in dollar terms. The real interest rate is the rate of interest corrected for inflation. The real interest rate is the nominal interest rate minus the rate of inflation.

Quick Check Multiple Choice

1. c
2. b
3. d
4. a
5. d
6. d

Problems and Applications

1. Answers will vary. Students should multiply \$100 by the CPI for the year in which they were born and then divide by 100.

2. a. Find the price of one unit of each good in each year:

Year	Cauliflower	Broccoli	Carrots
2013	\$2	\$1.50	\$0.10
2014	\$3	\$1.50	\$0.20

- b. If 2013 is the base year, the market basket used to compute the CPI is 100 heads of cauliflower, 50 bunches of broccoli, and 500 carrots. We must now calculate the cost of the market basket in each year:

$$\begin{aligned} & 2013: (100 \times \$2) + (50 \times \$1.50) + (500 \times \$0.10) \\ & = \$325 \\ & 2014: (100 \times \$3) + (50 \times \$1.50) + (500 \times \$0.20) \\ & = \$475 \end{aligned}$$

Then, using 2013 as the base year, we can compute the CPI in each year:

$$2013: \$325/\$325 \times 100 = 100$$

$$2014: \$475/\$325 \times 100 = 146$$

- c. We can use the CPI to compute the inflation rate for 2014:

$$(146 - 100)/100 \times 100 = 46\%$$

3. a. The percentage change in the price of tennis balls is $(\$2 - \$2)/\$2 \times 100 = 0\%$.
The percentage change in the price of golf balls is $(\$6 - \$4)/\$4 \times 100 = 50\%$.
The percentage change in the price of Gatorade is $(\$2 - \$1)/\$1 \times 100 = 100\%$.
- b. The cost of the market basket in 2014 is $(100 \times \$2) + (100 \times \$4) + (200 \times \$1) = \800 .

The cost of the market basket in 2015 is $(100 \times \$2) + (100 \times \$6) + (200 \times \$2) = \$1,200$.

Using 2014 as the base year, we can compute the CPI in each year:

$$2014 = (\$800/\$800) \times 100 = 100$$

$$2015 = (\$1,200/\$800) \times 100 = 150$$

We can use the CPI values to compute the percentage change in the overall price level:
 $(150-100)/100 \times 100 = 50\%$.

- c. This would lower my estimation of the inflation rate because the value of a bottle of Gatorade is now greater than before. The comparison should be made on a per-ounce basis.
 - d. More flavors enhance consumers' well-being. Thus, this would be considered a change in quality and would also lower my estimate of the inflation rate.
4. Answers will vary.
5. a. The cost of the market basket in 2014 is $(1 \times \$40) + (3 \times \$10) = \$70$.

The cost of the market basket in 2015 is $(1 \times \$60) + (3 \times \$12) = \$96$.

Using 2014 as the base year, we can compute the CPI in each year:

$$2014: \$70/\$70 \times 100 = 100$$

$$2015: \$96/\$70 \times 100 = 137.14$$

We can use the CPI to compute the inflation rate for 2015:

$$(137.14 - 100)/100 \times 100 = 37.14\%$$

b. $\text{Nominal GDP for 2014} = (10 \times \$40) + (30 \times \$10)$
 $= \$400 + \$300 = \$700.$

$$\text{Nominal GDP for 2015} = (12 \times \$60) + (50 \times \$12) =$$
$$\$720 + \$600 = \$1,320.$$

$$\text{Real GDP for 2014} = (10 \times \$40) + (30 \times \$10) = \$400$$
$$+ \$300 = \$700.$$

$$\text{Real GDP for 2015} = (12 \times \$40) + (50 \times \$10) = \$480$$
$$+ \$500 = \$980.$$

$$\text{The GDP deflator for 2014} = (\$700/\$700) \times 100 =$$
$$100.$$

$$\text{The GDP deflator for 2015} = (\$1,320/\$980) \times 100 =$$
$$134.69.$$

$$\text{The rate of inflation for 2015} = (134.69 - 100)/100 \times$$
$$100 = 34.69\%.$$

- c. No, it is not the same. The rate of inflation calculated by the CPI holds the basket of goods and services constant, while the GDP deflator allows it to change and holds the prices constant.
6. a. introduction of new goods; b. unmeasured quality change; c. substitution bias; d. unmeasured

quality change; e. substitution bias

7.
 - a. $(\$2.00 - \$0.15)/\$0.15 \times 100 = 1,233\%$.
 - b. $(\$23.09 - \$3.36)/\$3.36 \times 100 = 587\%$.
 - c. In 1970: $\$0.15/(\$3.36/60) = 2.7$ minutes. In 2011: $\$2.00/(\$23.09/60) = 5.2$ minutes.
 - d. Workers' purchasing power in terms of newspapers fell.
8.
 - a. If the elderly consume the same market basket as other people, Social Security would provide the elderly with an improvement in their standard of living each year because the CPI overstates inflation and Social Security payments are tied to the CPI.
 - b. Because the elderly consume more health care than younger people do, and because health care costs have risen faster than overall inflation, it is possible that the elderly are worse off. To investigate this, you would need to put together a market basket for the elderly, which would have a higher weight on health care. You would then compare the rise in the cost of the "elderly" basket with that of the general basket for CPI.
9.
 - a. When inflation is higher than was expected, the real interest rate is lower than expected. For example, suppose the market equilibrium has an expected real interest rate of 3% and people expect inflation to be 4%, so the nominal interest rate is 7%. If inflation turns out to be 5%, the real interest rate is 7% minus

5% equals 2%, which is less than the 3% that was expected.

- b. Because the real interest rate is lower than was expected, the lender loses and the borrower gains. The borrower is repaying the loan with dollars that are worth less than was expected.
- c. Homeowners in the 1970s who had fixed-rate mortgages from the 1960s benefited from the unexpected inflation, while the banks that made the mortgage loans were harmed.