

Macroeconomics, Masaryk University Spring 2017

Lecture 2: Measuring the Cost of Living

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Seventh Edition

Principles of Macroeconomics

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Wojciech Gerson (1831-1901)

CHAPTER 11

Measuring the Cost of Living

In this chapter, look for the answers to these questions

- What is the Consumer Price Index (CPI)? How is it calculated? What's it used for?
- What are the problems with the CPI? How serious are they?
- How does the CPI differ from the GDP deflator?
- How can we use the CPI to compare dollar amounts from different years? Why would we want to do this, anyway?
- How can we correct interest rates for inflation?

The Consumer Price Index (CPI)

- measures the typical consumer's cost of living
- the basis of cost of living adjustments (COLAs) in many contracts and in Social Security

How the CPI Is Calculated

1. ***Fix the “basket.”***

The Bureau of Labor Statistics (BLS) surveys consumers to determine what’s in the typical consumer’s “shopping basket.”

2. ***Find the prices.***

The BLS collects data on the prices of all the goods in the basket.

3. ***Compute the basket’s cost.***

Use the prices to compute the total cost of the basket.

How the CPI Is Calculated

4. **Choose a base year and compute the index.**

The CPI in any year equals

$$100 \times \frac{\text{cost of basket in current year}}{\text{cost of basket in base year}}$$

5. **Compute the inflation rate.**

The percentage change in the CPI from the preceding period.

$$\text{Inflation rate} = \frac{\text{CPI this year} - \text{CPI last year}}{\text{CPI last year}} \times 100\%$$

EXAMPLE

basket: {4 pizzas, 10 lattes}

<i>year</i>	<i>price of pizza</i>	<i>price of latte</i>	<i>cost of basket</i>
2010	\$10	\$2.00	$\$10 \times 4 + \$2 \times 10 = \$60$
2011	\$11	\$2.50	$\$11 \times 4 + \$2.5 \times 10 = \$69$
2012	\$12	\$3.00	$\$12 \times 4 + \$3 \times 10 = \$78$

Compute CPI in each year

Inflation rate:

$$\begin{aligned} 2010: & 100 \times (\$60/\$60) = 100 \\ 2011: & 100 \times (\$69/\$60) = 115 \\ 2012: & 100 \times (\$78/\$60) = 130 \end{aligned} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} 15\% \\ 13\% \end{array} = \begin{array}{l} \frac{115 - 100}{100} \times 100\% \\ \frac{130 - 115}{115} \times 100\% \end{array}$$

using 2010 base year:

ACTIVE LEARNING 1

Calculate the CPI

CPI basket:

{10 lbs beef,
20 lbs chicken}

The CPI basket cost \$120
in 2010, the base year.

	<i>price of beef</i>	<i>price of chicken</i>
2010	\$4	\$4
2011	\$5	\$5
2012	\$9	\$6

- A.** Compute the CPI in 2011.
- B.** What was the CPI inflation rate from 2011–2012?

ACTIVE LEARNING 1

Answers

CPI basket:

{10 lbs beef,
20 lbs chicken}

The CPI basket cost \$120
in 2010, the base year.

	<i>price of beef</i>	<i>price of chicken</i>
2010	\$4	\$4
2011	\$5	\$5
2012	\$9	\$6

A. Compute the CPI in 2011:

Cost of CPI basket in 2011

$$= (\$5 \times 10) + (\$5 \times 20) = \$150$$

$$\text{CPI in 2011} = 100 \times (\$150/\$120) = \mathbf{125}$$

ACTIVE LEARNING 1

Answers

CPI basket:

{10 lbs beef,
20 lbs chicken}

The CPI basket cost \$120
in 2010, the base year.

	<i>price of beef</i>	<i>price of chicken</i>
2010	\$4	\$4
2011	\$5	\$5
2012	\$9	\$6

B. What was the inflation rate from 2011–2012?

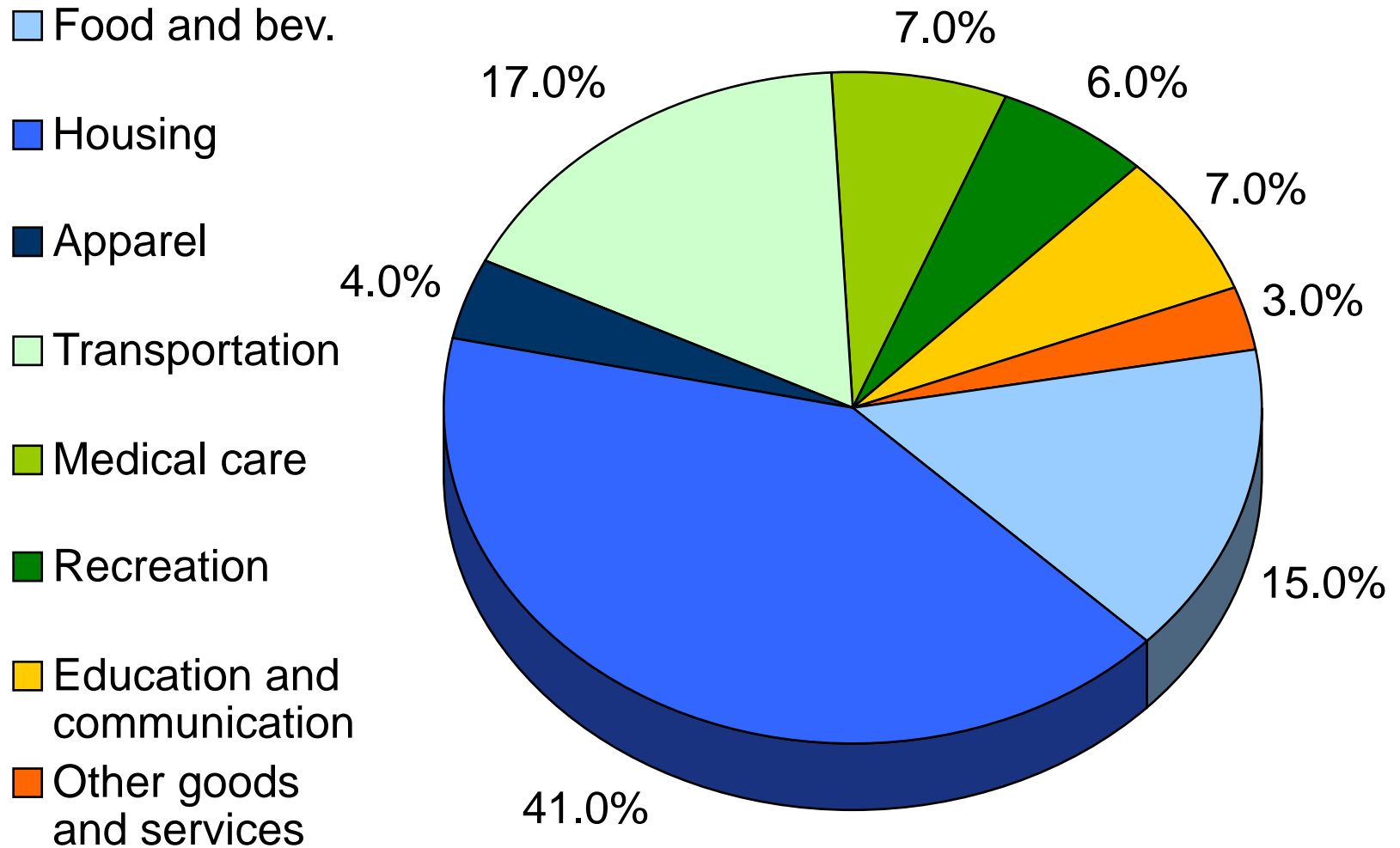
Cost of CPI basket in 2012

$$= (\$9 \times 10) + (\$6 \times 20) = \$210$$

$$\text{CPI in 2012} = 100 \times (\$210/\$120) = 175$$

$$\text{CPI inflation rate} = (175 - 125)/125 = 40\%$$

What's in the CPI's Basket?



ACTIVE LEARNING 2

Substitution bias

CPI basket:

{10 lbs beef,
20 lbs chicken}

In 2010 and 2011,
households
bought CPI basket.

	<i>beef</i>	<i>chicken</i>	<i>cost of CPI basket</i>
2010	\$4	\$4	\$120
2011	\$5	\$5	\$150
2012	\$9	\$6	\$210

In 2012, households bought {5 lbs beef, 25 lbs chicken}.

- A.** Compute cost of the 2012 household basket.
- B.** Compute % increase in cost of household basket over 2011–12, compare to CPI inflation rate.

ACTIVE LEARNING 2

Answers

CPI basket:

{10 lbs beef,
20 lbs chicken}

Household

basket in 2012:

{5 lbs beef,
25 lbs chicken}

	<i>beef</i>	<i>chicken</i>	<i>cost of CPI basket</i>
2010	\$4	\$4	\$120
2011	\$5	\$5	\$150
2012	\$9	\$6	\$210

A. Compute cost of the 2012 household basket.

$$(\$9 \times 5) + (\$6 \times 25) = \$195$$

ACTIVE LEARNING 2

Answers

CPI basket:

{10 lbs beef,
20 lbs chicken}

Household

basket in 2012:

{5 lbs beef,
25 lbs chicken}

	<i>beef</i>	<i>chicken</i>	<i>cost of CPI basket</i>
2010	\$4	\$4	\$120
2011	\$5	\$5	\$150
2012	\$9	\$6	\$210

B. Compute % increase in cost of household basket over 2011–12, compare to CPI inflation rate.

Rate of increase: $(\$195 - \$150)/\$150 = 30\%$

CPI inflation rate from previous problem = 40%

Problems with the CPI:

Substitution Bias

- Over time, some prices rise faster than others.
- Consumers substitute toward goods that become relatively cheaper, mitigating the effects of price increases.
- The CPI misses this substitution because it uses a fixed basket of goods.
- Thus, the CPI overstates increases in the cost of living.

Problems with the CPI:

Introduction of New Goods

- The introduction of new goods increases variety, allows consumers to find products that more closely meet their needs.
- In effect, dollars become more valuable.
- The CPI misses this effect because it uses a fixed basket of goods.
- Thus, the CPI overstates increases in the cost of living.

Problems with the CPI:

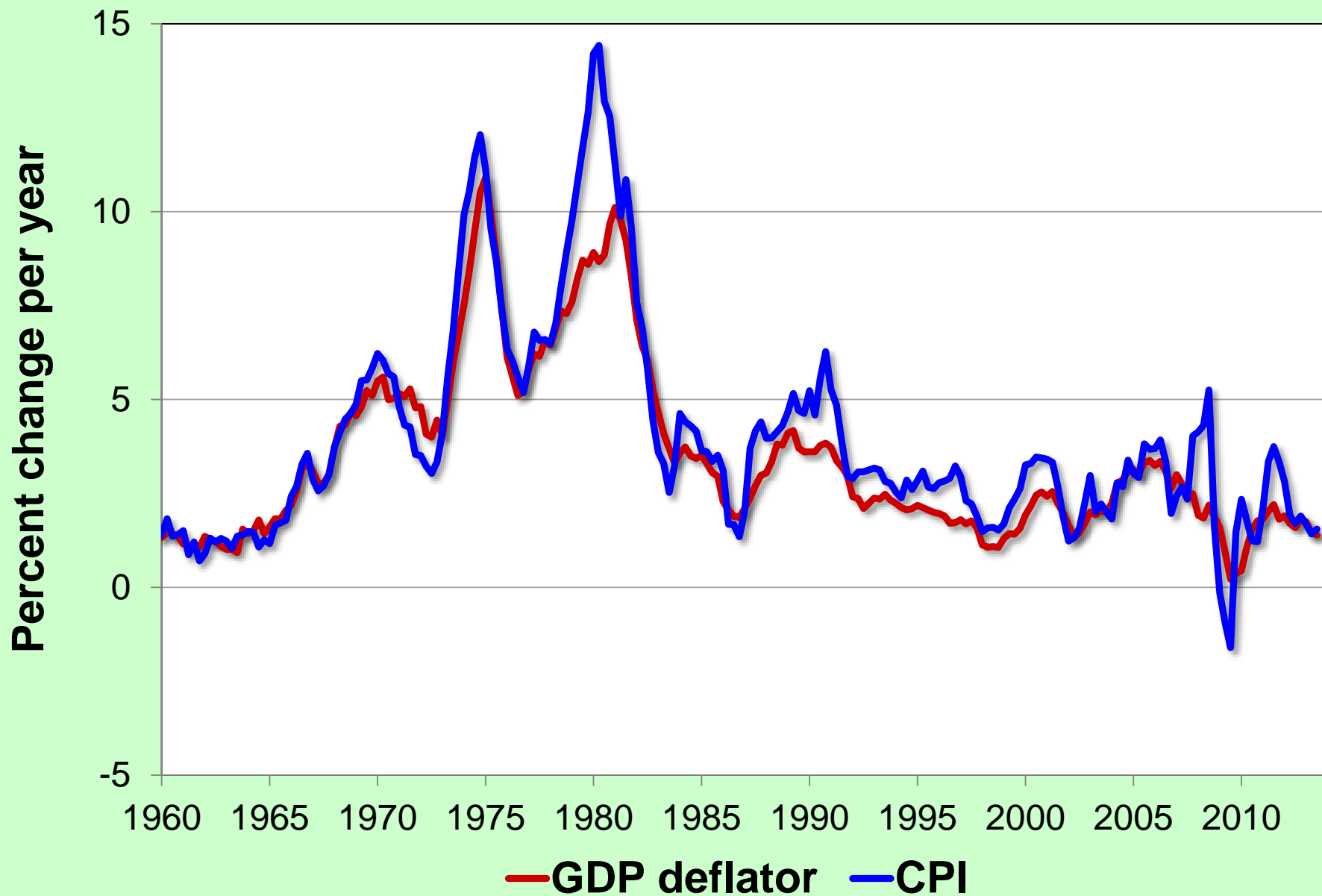
Unmeasured Quality Change

- Improvements in the quality of goods in the basket increase the value of each dollar.
- The BLS tries to account for quality changes but probably misses some, as quality is hard to measure.
- Thus, the CPI overstates increases in the cost of living.

Problems with the CPI

- Each of these problems causes the CPI to overstate cost of living increases.
- The BLS has made technical adjustments, but the CPI probably still overstates inflation by about 0.5 percent per year.
- This is important because Social Security payments and many contracts have COLAs tied to the CPI.

Two Measures of Inflation, 1960–2013



Contrasting the CPI and GDP Deflator

Imported consumer goods:

- included in CPI
- excluded from GDP deflator

Capital goods:

- excluded from CPI
- included in GDP deflator (if produced domestically)

The basket:

- CPI uses fixed basket
- GDP deflator uses basket of currently produced goods & services

This matters if different prices are changing by different amounts.

ACTIVE LEARNING 3

CPI vs. GDP deflator

In each scenario, determine the effects on the CPI and the GDP deflator.

- A.** Starbucks raises the price of Frappuccinos.
- B.** Caterpillar raises the price of the industrial tractors it manufactures at its Illinois factory.
- C.** Armani raises the price of the Italian jeans it sells in the U.S.

ACTIVE LEARNING 3

Answers

A. Starbucks raises the price of Frappuccinos.

The CPI and GDP deflator both rise.

B. Caterpillar raises the price of the industrial tractors it manufactures at its Illinois factory.

The GDP deflator rises, the CPI does not.

C. Armani raises the price of the Italian jeans it sells in the U.S.

The CPI rises, the GDP deflator does not.

Correcting Variables for Inflation: Comparing Dollar Figures from Different Times

- Inflation makes it harder to compare dollar amounts from different times.
- Example: the minimum wage
 - \$1.25 in Dec 1963
 - \$7.25 in Dec 2013
- Did min wage have more purchasing power in Dec 1963 or Dec 2013?
- To compare, use CPI to convert 1963 figure into “2013 dollars”...

Correcting Variables for Inflation: Comparing Dollar Figures from Different Times

$$\text{Amount in today's dollars} = \text{Amount in year } T \text{ dollars} \times \frac{\text{Price level today}}{\text{Price level in year } T}$$

- In our example,
 - “year T ” is 12/1963, “today” is 12/2013
 - Min wage was \$1.25 in year T
 - CPI = 30.9 in year T , CPI = 234.6 today

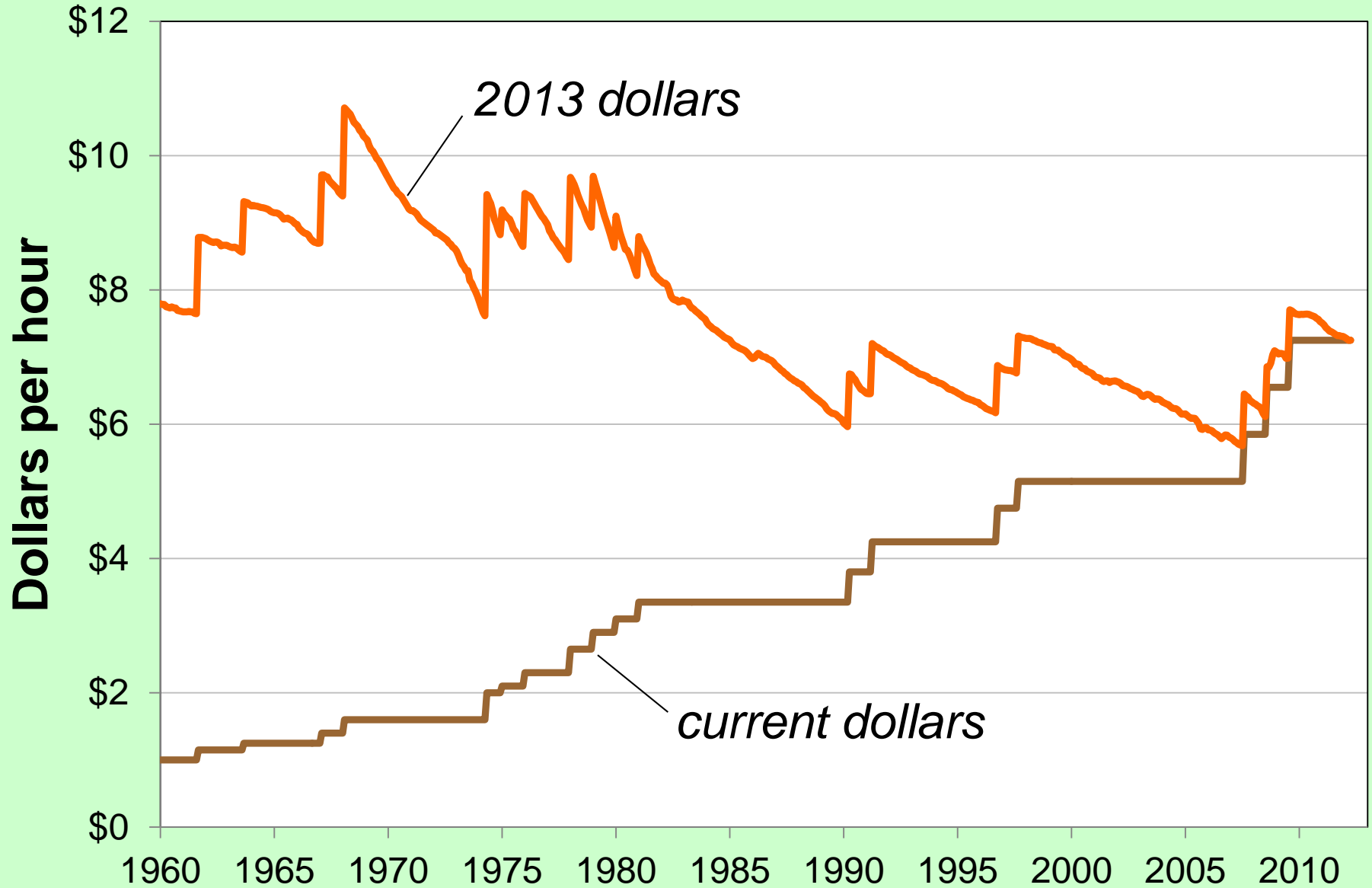
The minimum wage in 1963 was \$9.49 in 2013 dollars.

$$\mathbf{\$9.49} = \$1.25 \times \frac{234.6}{30.9}$$

Correcting Variables for Inflation: Comparing Dollar Figures from Different Times

- Researchers, business analysts, and policymakers often use this technique to convert a time series of current-dollar (nominal) figures into constant-dollar (real) figures.
- They can then see how a variable has changed over time after correcting for inflation.
- Example: the minimum wage...

The U.S. Minimum Wage in Current Dollars and Today's Dollars, 1960–2013



ACTIVE LEARNING 4

Comparing tuition increases

Tuition and Fees at U.S. Colleges and Universities		
	1990	2013
Private non-profit 4-year	\$9,340	\$30,094
Public 4-year	\$1,908	\$8,893
Public 2-year	\$906	\$3,264
CPI	130.7	232.6

Instructions: Express the 1990 tuition figures in 2013 dollars, then compute the percentage increase in real terms for all three types of schools. Which type experienced the largest increase in real tuition costs?

ACTIVE LEARNING 4

Answers

	1990	2013	% change
CPI	130.7	232.6	78.0%
Private non-profit 4-year (current \$)	\$9,340	\$30,094	
Private non-profit 4-year (2010 \$)	\$16,622	\$30,094	81.1%
Public 4-year (current \$)	\$1,908	\$8,893	
Public 4-year (2010 \$)	\$3,396	\$8,893	161.9%
Public 2-year (current \$)	\$906	\$3,264	
Public 2-year (2010 \$)	\$1,612	\$3,264	102.4%

Correcting Variables for Inflation: Indexation

A dollar amount is **indexed** for inflation if it is automatically corrected for inflation by law or in a contract.

For example, the increase in the CPI automatically determines:

- the COLA in many multi-year labor contracts.
- adjustments in Social Security payments and federal income tax brackets.

Correcting Variables for Inflation: Real vs. Nominal Interest Rates

The nominal interest rate:

- the interest rate not corrected for inflation
- the rate of growth in the dollar value of a deposit or debt

The real interest rate:

- corrected for inflation
- the rate of growth in the purchasing power of a deposit or debt

Real interest rate

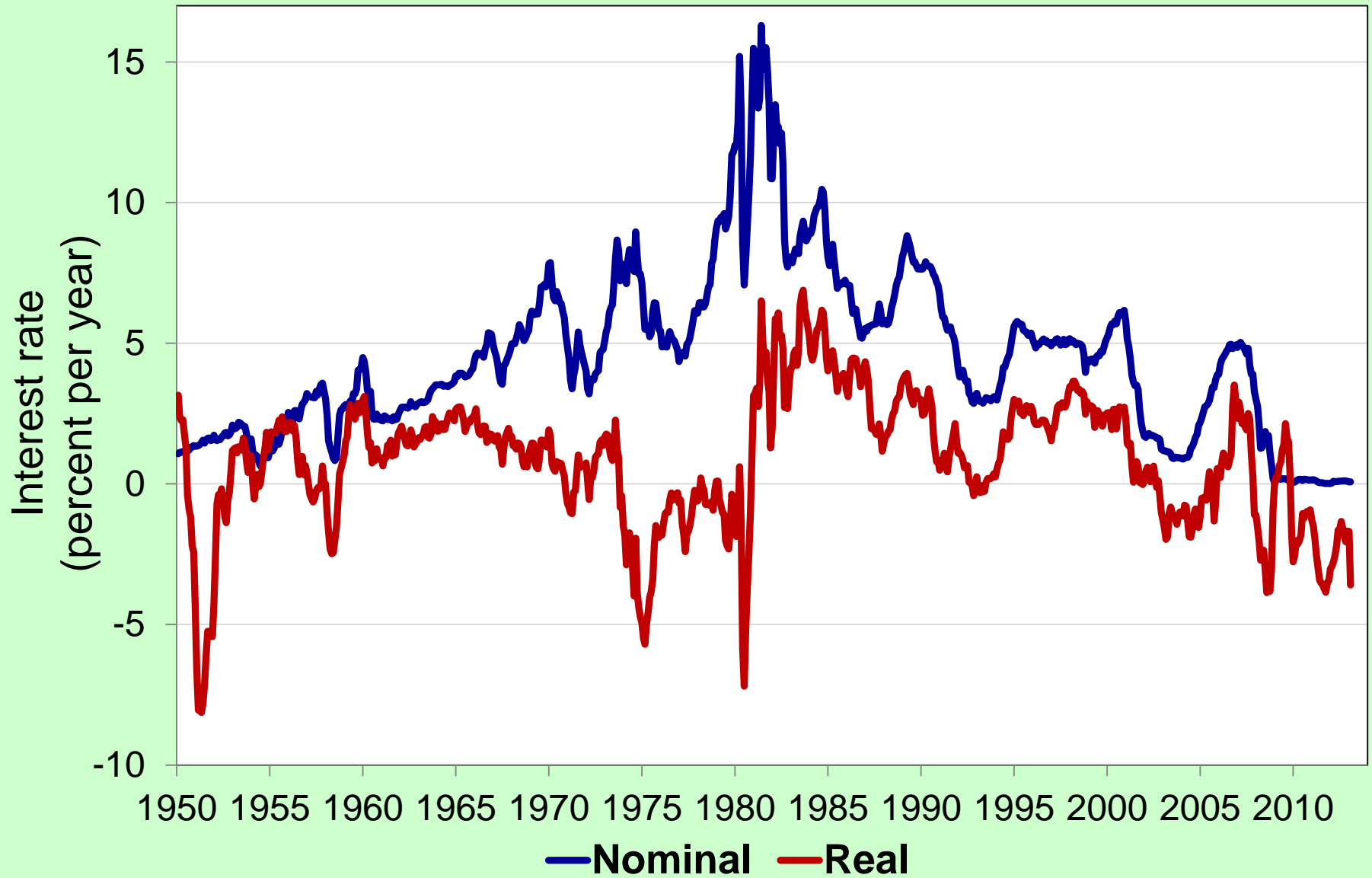
$$= (\text{nominal interest rate}) - (\text{inflation rate})$$

Correcting Variables for Inflation: Real vs. Nominal Interest Rates

Example:

- Deposit \$1,000 for one year.
- Nominal interest rate is 9%.
- During that year, inflation is 3.5%.
- Real interest rate
= Nominal interest rate – Inflation
= 9.0% – 3.5% = **5.5%**
- The purchasing power of the \$1000 deposit has grown 5.5%.

Real and Nominal Interest Rates in the U.S., 1950–2013



Summary

- The Consumer Price Index is a measure of the cost of living. The CPI tracks the cost of the typical consumer's "basket" of goods & services.
- The CPI is used to make Cost of Living Adjustments and to correct economic variables for the effects of inflation.
- The real interest rate is corrected for inflation and is computed by subtracting the inflation rate from the nominal interest rate.