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PRINCIPLES OF

MACROECONOMICS

Eighth Edition

CHAPTER

11

Measuring the Cost of Living

Learning outcomes:

After this lecture, students are expected to understand:

- 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

- Consumer price index (CPI)
  - Measure of the overall level of prices
  - Measure of the overall cost of goods and services
    - Bought by a typical consumer
  - Computed and reported every month by the central statistical offices

Calculating CPI

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

Calculating CPI

4. Chose a base year and compute the CPI
   - Cost of basket of goods and services in current year divided by cost of basket in base year
   - Times 100
5. Compute the inflation rate
   - The percentage change in the CPI from the preceding period

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

EXAMPLE: basket: {4 pizzas, 10 lattes}

year	*price of pizza*	*price of latte*	*cost of basket*
2014	$10	$2.00	$10 x 4 + $2 x 10 = $60
2015	$11	$2.50	$11 x 4 + $2.5 x 10 = $69
2016	$12	$3.00	$12 x 4 + $3 x 10 = $78

Compute CPI in each year (2014 base year)

Compute the inflation rate for 2015 and 2016.

EXAMPLE: basket: {4 pizzas, 10 lattes}

year	*price of pizza*	*price of latte*	*cost of basket*
2014	\$10	\$2.00	\$10 x 4 + \$2 x 10 = \$60
2015	\$11	\$2.50	\$11 x 4 + \$2.5 x 10 = \$69
2016	\$12	\$3.00	\$12 x 4 + \$3 x 10 = \$78

Compute CPI in each year
(2014 base year)

2014: 100 x (\$60/\$60) = 100

2015: 100 x (\$69/\$60) = 115

2016: 100 x (\$78/\$60) = 130

Inflation rate:

$$15\% = \frac{115 - 100}{100} \times 100\%$$

$$13\% = \frac{130 - 115}{115} \times 100\%$$

Active Learning 1 Calculating the CPI

CPI basket:
{10 kgs beef,
20 kgs chicken}

The CPI basket cost $120 in 2014, the base year.

	price of beef	*price of chicken*
2014	$4	$4
2015	$5	$5
2016	$9	$6

A. Compute the CPI in 2015.

B. What was the CPI inflation rate from 2015–2016?

Active Learning 1 Answers

CPI basket:
{10 kgs beef,
20 kgs chicken}

The CPI basket cost $120 in 2014, the base year.

	price of beef	*price of chicken*
2014	$4	$4
2015	$5	$5
2016	$9	$6

A. Compute the CPI in 2015.

Cost of CPI basket in 2015=($5x10)+($5x20)= $150

CPI in 2015 = 100 x ($150/$120) = 125

Active Learning 1 Answers

CPI basket:
{10 kgs beef,
20 kgs chicken}

The CPI basket cost $120 in 2014, the base year.

	price of beef	*price of chicken*
2014	$4	$4
2015	$5	$5
2016	$9	$6

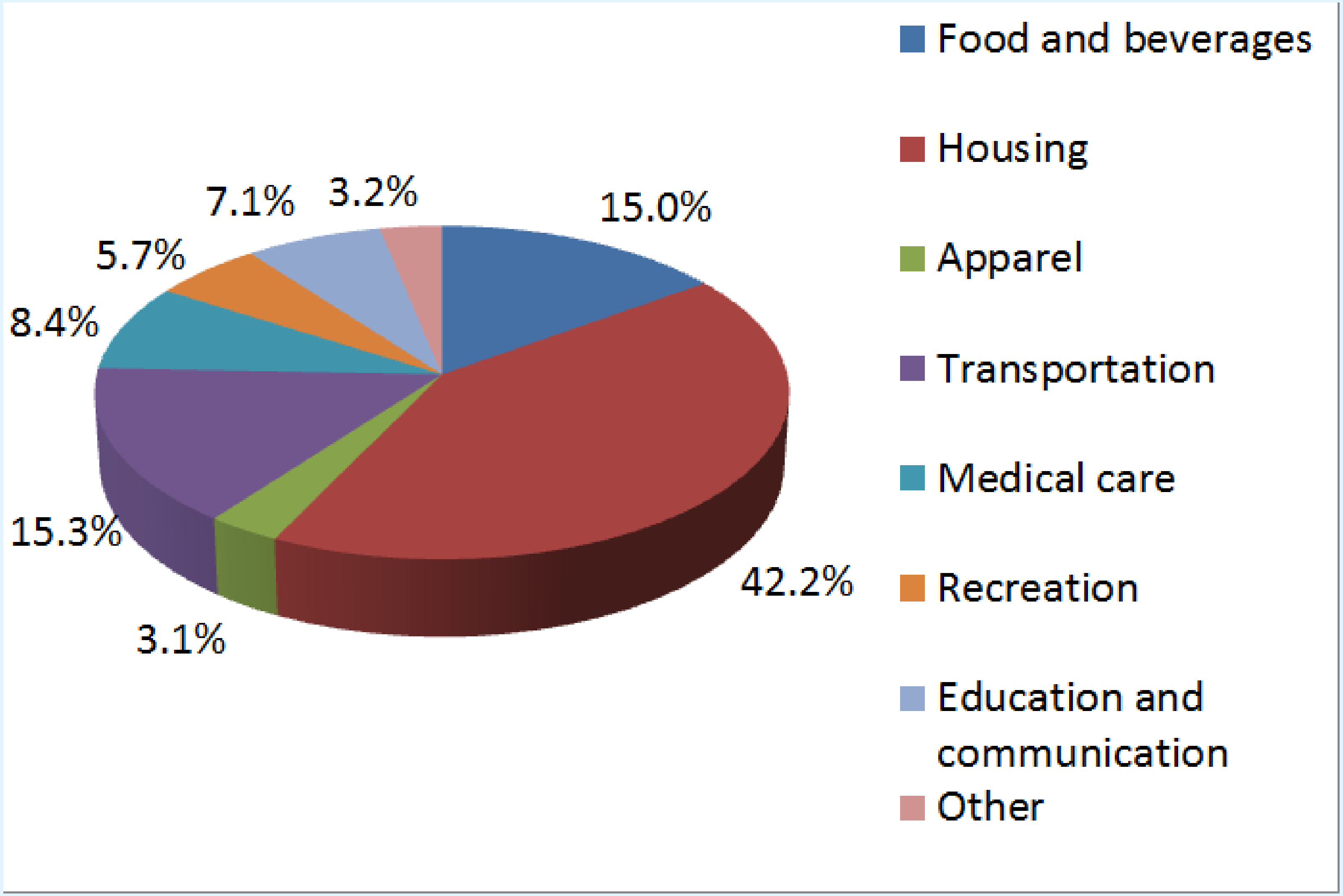
B. What was the CPI inflation rate from 2015–2016?

Cost of CPI basket in 2016=($9 x10)+($6 x20)= $210

CPI in 2016 = 100 x ($210/$120) = 175

CPI inflation rate = (175 – 125)/125 = 40%

What's in the CPI's Basket?



Active Learning 2 Substitution bias

CPI basket:
{10 kgs beef,
20 kgs chicken}

In 2014 and 2015, households bought CPI basket.

	beef	*chicken*	*cost of CPI basket*
2014	\$4	\$4	\$120
2015	\$5	\$5	\$150
2016	\$9	\$6	\$210

In 2016, households bought {5 kgs beef, 25 kgs chicken}.

A. Compute cost of the 2016 household basket.

B. Compute % increase in cost of household basket over 2015–2016, compare to CPI inflation rate.

Active Learning 2 Answers

CPI basket:
{10 kgs beef,
20 kgs chicken}

In 2014 and 2015, households bought CPI basket.

	beef	*chicken*	*cost of CPI basket*
2014	$4	$4	$120
2015	$5	$5	$150
2016	$9	$6	$210

In 2016, households bought {5 kgs beef, 25 kgs chicken}.

A. Compute cost of the 2016 household basket.

($9 x 5) + ($6 x 25) = $195

Active Learning 2 Answers

CPI basket:
{10 kgs beef,
20 kgs chicken}

In 2014 and 2015, households bought CPI basket.

	beef	*chicken*	*cost of CPI basket*
2014	$4	$4	$120
2015	$5	$5	$150
2016	$9	$6	$210

In 2016, households bought {5 kgs beef, 25 kgs chicken}.

B. Compute % increase in cost of household basket over 2015–2016, 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.

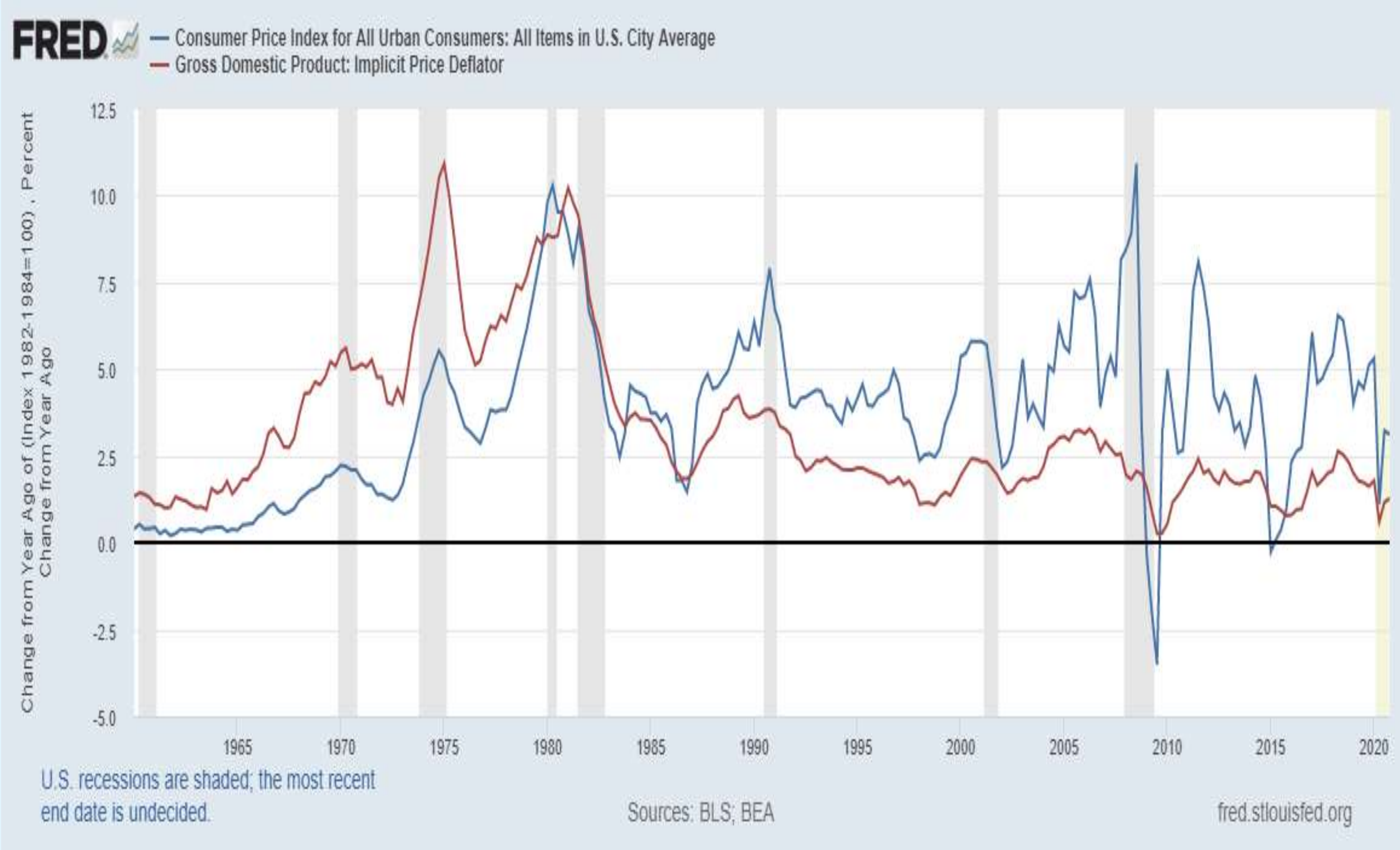
Problems with the CPI

- 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, 1960–2020



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)

Contrasting the CPI and GDP Deflator

- 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. A local manufacturer raises the price of the industrial tractors it produces.

C. Armani raises the price of the Italian jeans it sells in the Czech Republic.

Active Learning 3 Answers

A. Starbucks raises the price of Frappuccinos.

The CPI and GDP deflator both rise.

B. A local manufacturer raises the price of the industrial tractors it produces.

The GDP deflator rises, the CPI does not.

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

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 in the U.S.
    - \$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

- Dollar figures from different times

$$\text{Amount } \textit{in today's dollars} =$$

$$= \textit{Amount in year T dollars} \times \frac{\textit{Price level today}}{\textit{Price level in year T}}$$

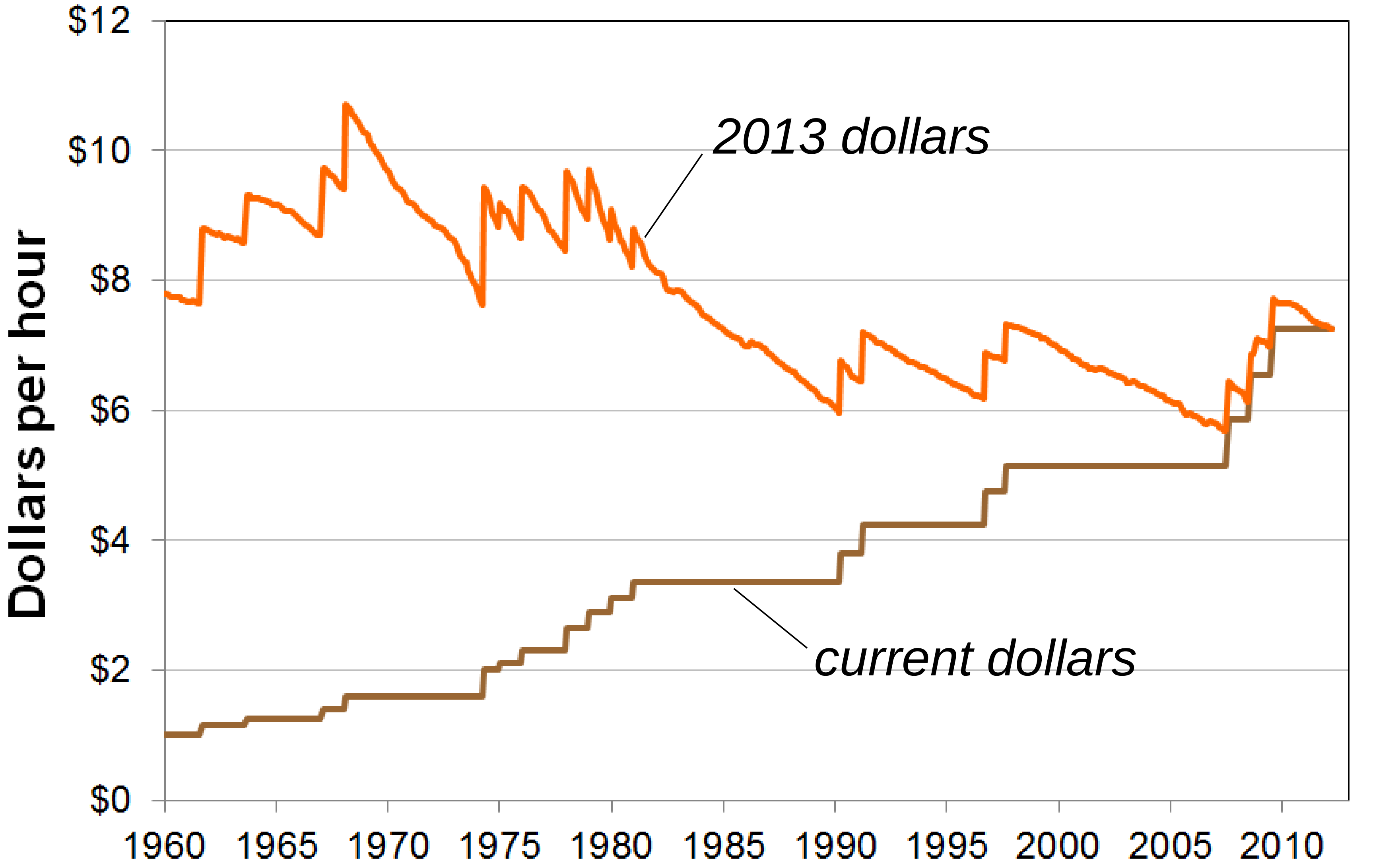
- In our example:
  - "year T " is 1963, "today" is 2013
  - Min wage was \$1.25 in year T
  - CPI = 30.9 in year T, CPI = 234.6 today
  - The minimum wage in 1963 was"

  \$1.25 x 234.6/30.9 = \$9.49 in 2013 dollars.

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	2015
Private non-profit 4-year	$9,340	$32,405
Public 4-year	$1,908	$9,410
Public 2-year	$906	$3,435
CPI	130.7	237.7

- Express the 1990 tuition figures in 2015 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	2015	% change
CPI	130.7	237.7	81.9%
Private non-profit 4-year (current $)	$9,340	$32,405	
Private non-profit 4-year (in 2015 $)	$16,986	$32,405	90.8%
Public 4-year (current $)	$1,908	$9,410	
Public 4-year (in 2015 $)	$3,470	$9,410	171.2%
Public 2-year (current $)	$906	$3,435	
Public 2-year (in 2015 $)	$1,648	$3,435	108.4%

Correcting Variables for Inflation

Real vs. Nominal Interest Rates

- The nominal interest rate:
  - Interest rate not corrected for inflation
  - Rate of growth in the dollar value of a deposit or debt
- The real interest rate:
  - Corrected for inflation
  - Rate of growth in the purchasing power of a deposit or debt

Real interest rate=(nominal interest rate)–(inflation rate)

Real vs. Nominal Interest Rates

Example:

– Deposit $1,000 for one year.

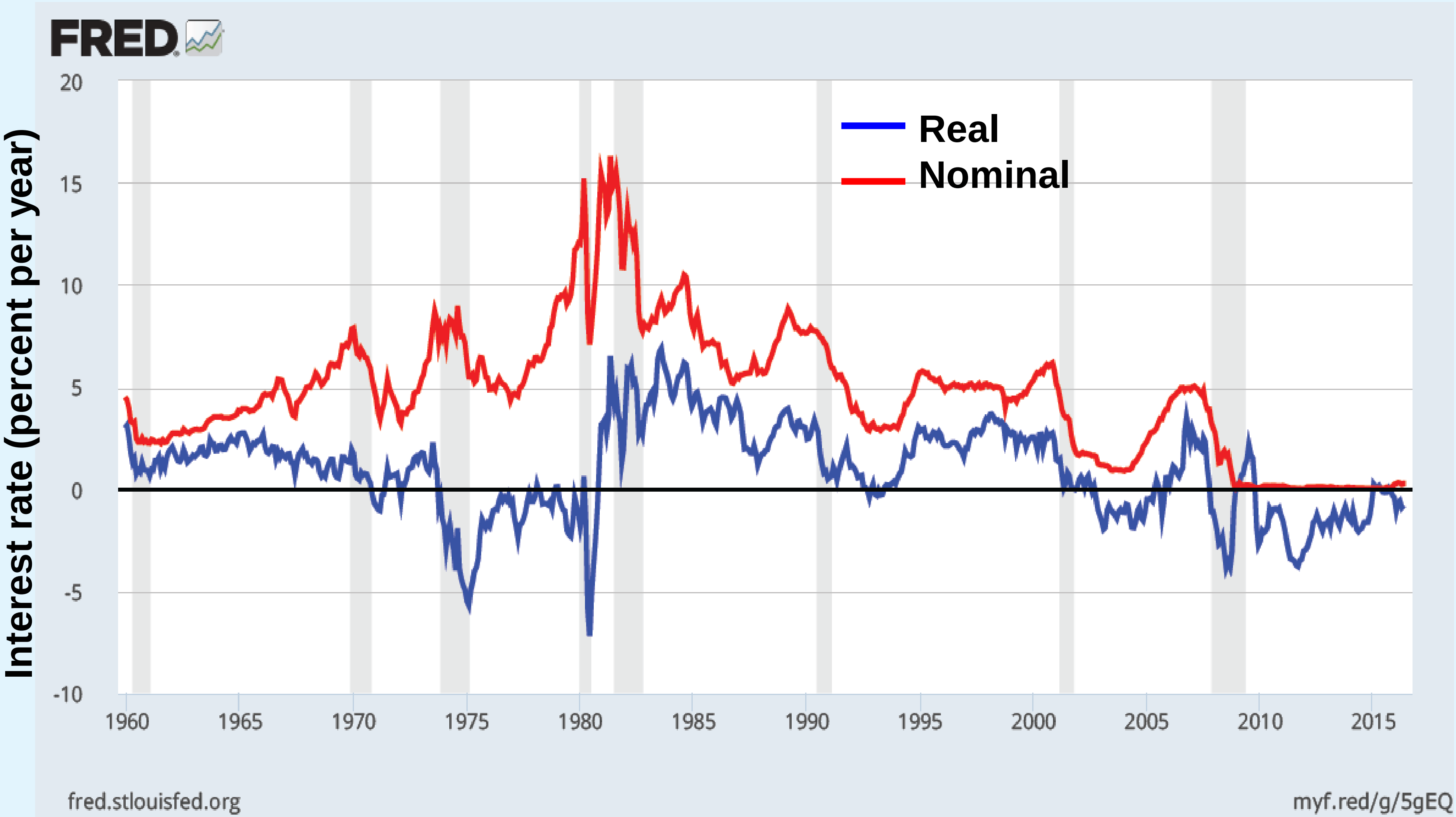
– Nominal interest rate is 9%.

– 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., 1960–2015



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.