Topic 2:

Macroeconomic Data

(chapter 2)

revised 9/15/09

Learning objectives

In this chapter, you will learn about how we define and measure:

- Gross Domestic Product (GDP)
- the Consumer Price Index (CPI)
- the Unemployment Rate

Gross Domestic Product: Expenditure and Income

Two definitions:

- Total expenditure on domestically-produced final goods and services.
- Total income earned by domestically-located factors of production.

Expenditure equals income because every dollar a buyer spends becomes income to the seller.

The expenditure components of GDP

- consumption, ***C***
- investment, ***I***
- government spending, ***G***
- net exports, ***NX***

An important identity:

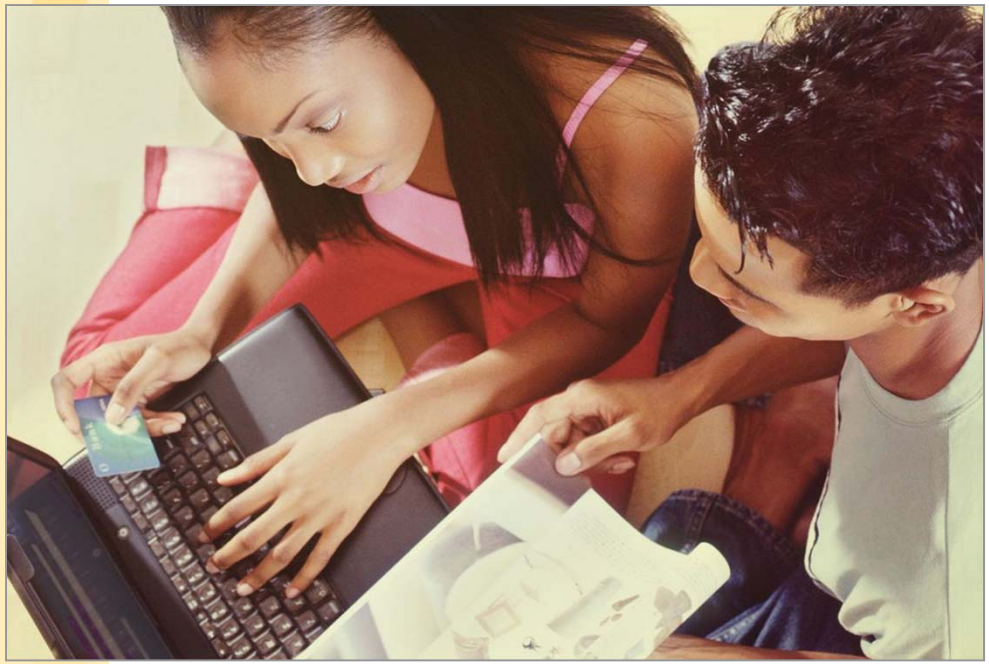
$$Y = C + I + G + NX$$

value of total output

aggregate expenditure

Consumption (C)

def: the value of all goods and services bought by households. Includes:



- ***durable goods***
  last a long time
  ex: cars, home appliances
- ***non-durable goods***
  last a short time
  ex: food, clothing
- ***services***
  work done for consumers
  ex: dry cleaning, air travel.

U.S. consumption, 2011

	$ billions	*% of GDP*
Consumption	10,726	71.1
Durables	1,163	7.7
Nondurables	2,484	16.5
Services	7,079	46.9

Investment (I)

- Spending on capital, a physical asset used in future production
- Includes:
  - ***Business fixed investment***
    Spending on plant and equipment
  - ***Residential fixed investment***
    Spending by consumers and landlords on housing units
  - ***Inventory investment***
    The change in the value of all firms' inventories

U.S. Investment, 2011

	$ billions	*% of GDP*
Investment	1,916	12.7
Business fixed	1,532	10.2
Residential	338	2.2
Inventory	46	0.3

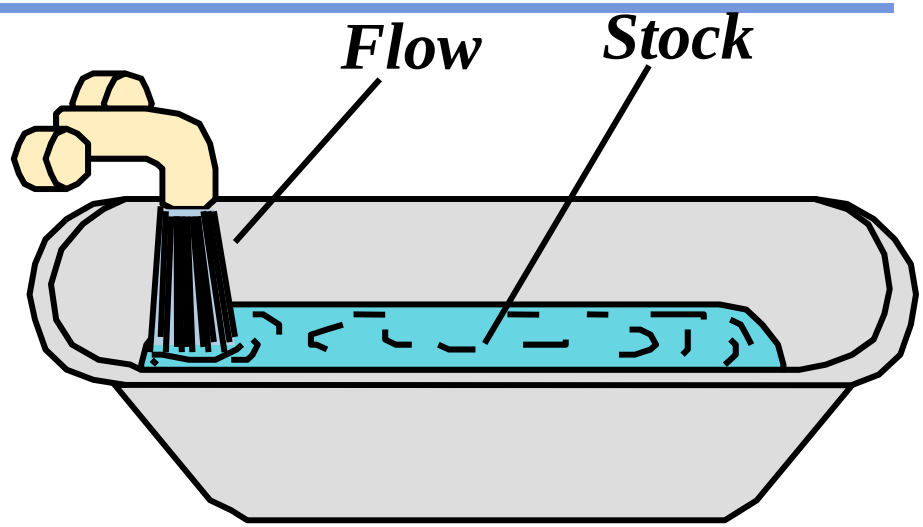
Investment vs. Capital

Note: Investment is spending on new capital.

Example *(assumes no depreciation)*:

- 1/1/2012:
  Economy has $10 trillion worth of capital
- during 2012:
  Investment = $2 trillion
- 1/1/2013:
  Economy will have $12 trillion worth of capital

Stocks vs. Flows



A **stock** is a quantity measured at a point in time.

E.g.,
"The U.S. capital stock was $10 trillion on January 1, 2012."

A **flow** is a quantity measured per unit of time.
E.g., "U.S. investment was $2 trillion during 2012."

Government spending (G)

- **G** includes all government spending on goods and services.
- **G** excludes transfer payments (e.g. unemployment insurance payments), because they do not represent spending on goods and services.

U.S. Government Spending, 2011

	$ billions	% of GDP
Govt spending	3,031	20.1
- Federal	1,233	8.2
Non-defense	408	2.7
Defense	825	5.5
- State & local	1,798	11.9

Net exports (NX = EX - IM)

def: total exports to other countries (**EX**)
minus the value of total imports (**IM**)

An important identity

$$\mathbf{Y} = \mathbf{C} + \mathbf{I} + \mathbf{G} + \mathbf{NX}$$

where

Y = GDP = the value of total output

C + **I** + **G** + **NX** = aggregate expenditure

A question for you:

Suppose a firm

- produces $10 million worth of final goods
- but only sells $9 million worth.

Does this violate the
expenditure = output identity?

Why output = expenditure

- Unsold output goes into inventory, and is counted as “inventory investment”... ...whether the inventory buildup was intentional or not.
- In effect, we are assuming that firms purchase their unsold output.

GDP:
An important and versatile concept

We have now seen that GDP measures

- total income
- total output
- total expenditure
- the sum of value-added at all stages in the production of final goods

GNP vs. GDP

- Gross **National** Product (GNP):
  total income earned by the nation's factors of production, regardless of where located

- Gross **Domestic** Product (GDP):
  total income earned by domestically-located factors of production, regardless of nationality.

(GNP – GDP) = (factor payments from abroad)
– (factor payments to abroad)

Discussion Question:

What explains why GNP differs from GDP for some of the following countries?

GNP vs. GDP in select countries, 2010

Country	*GNP*	*GDP*	*GNP – GDP (% of GDP)*
Bangladesh	109,695	100,357	9.3
Japan	5,601,557	5,458,837	2.6
China	5,957,012	5,926,612	0.5
United States	14,635,600	14,586,736	0.3
India	1,712,645	1,727,111	-0.8
Canada	1,549,652	1,577,040	-1.7
Greece	292,874	301,083	-2.7
Iraq	77,842	82,150	-5.2
Ireland	171,260	206,612	-17.1

GNP and GDP in millions of current U.S. dollars

Real vs. Nominal GDP

- GDP is the value of all final goods and services produced.
- **Nominal GDP** measures these values using current prices.
- **Real GDP** measure these values using the prices of a base year.

Real GDP controls for inflation

Changes in nominal GDP can be due to:

- changes in prices
- changes in quantities of output produced

Changes in real GDP can only be due to changes in quantities,

because real GDP is constructed using constant base-year prices.

Practice problem

	2012		2013	
	P	Q	P	Q
good A	$1	10	$2	15
good B	$10	3	$15	4

- Compute nominal GDP in 2012 and 2013
- Compute real GDP in each year using 2012 as the base year.

Answers to practice problem

- Nominal GDP *multiply Ps & Qs from same year*

  2012: \$1 x 10 + \$10 x 3 = \$40

  2013: \$2 x 15 + \$15 x 4 = \$90

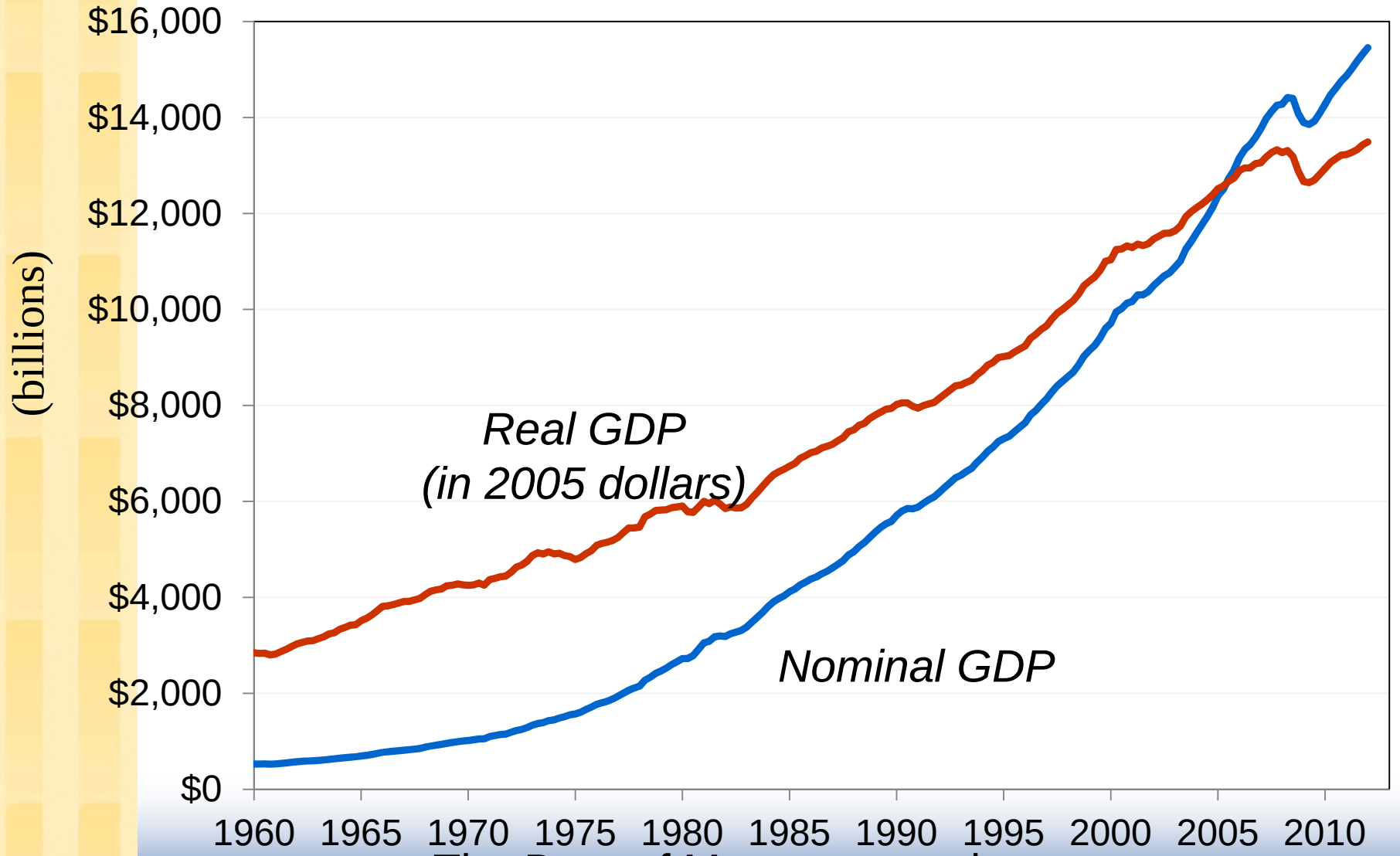
- Real GDP *multiply each year's Qs by 2002 Ps*

  2012: as above: \$40

  2013: \$1 x 15 + \$10 x 4 = \$55 (2012\$)

- So in real terms, GDP did not rise as much as it would seem from nominal terms.

U.S. Nominal and Real GDP, 1960-2012



GDP Deflator

- The **inflation rate** is the percentage increase in the overall level of prices.
- One measure of the price level is the **GDP Deflator**, defined as

$$\text{GDP deflator} = 100 \times \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

Understanding the GDP deflator

Example with 3 goods

For good i = 1, 2, 3

P_{it} = the market price of good i in month t

Q_{it} = the quantity of good i produced in month t

$NGDP_t$ = Nominal GDP in month t

$RGDP_t$ = Real GDP in month t

Understanding the GDP deflator

$$\text{GDP deflator} = 100 \times \frac{\text{NGDP}_t}{\text{RGDP}_t} = 100 \times \frac{P_{1t}Q_{1t} + P_{2t}Q_{2t} + P_{3t}Q_{3t}}{\text{RGDP}_t}$$

$$= 100 \times \left[\left(\frac{Q_{1t}}{\text{RGDP}_t} \right) P_{1t} + \left(\frac{Q_{2t}}{\text{RGDP}_t} \right) P_{2t} + \left(\frac{Q_{3t}}{\text{RGDP}_t} \right) P_{3t} \right]$$

The GDP deflator is a weighted average of prices.

The weight on each price reflects that good's relative importance in GDP.

Note that the weights change over time.

Working with percentage changes

USEFUL TRICK #1 For any variables X and Y,

the percentage change in $(X \times Y)$

$\approx$ the percentage change in X

\+ the percentage change in Y

EX: If your hourly wage rises 5%

and you work 7% more hours,

then your wage income rises approximately 12%.

Working with percentage changes

USEFUL TRICK #2

the percentage change in (X/Y)

$\approx$ the percentage change in X

$-$ the percentage change in Y

EX: GDP deflator $= 100 \times$ NGDP/RGDP.

If NGDP rises 9% and RGDP rises 4%,

then the inflation rate is approximately 5%.

Consumer Price Index (CPI)

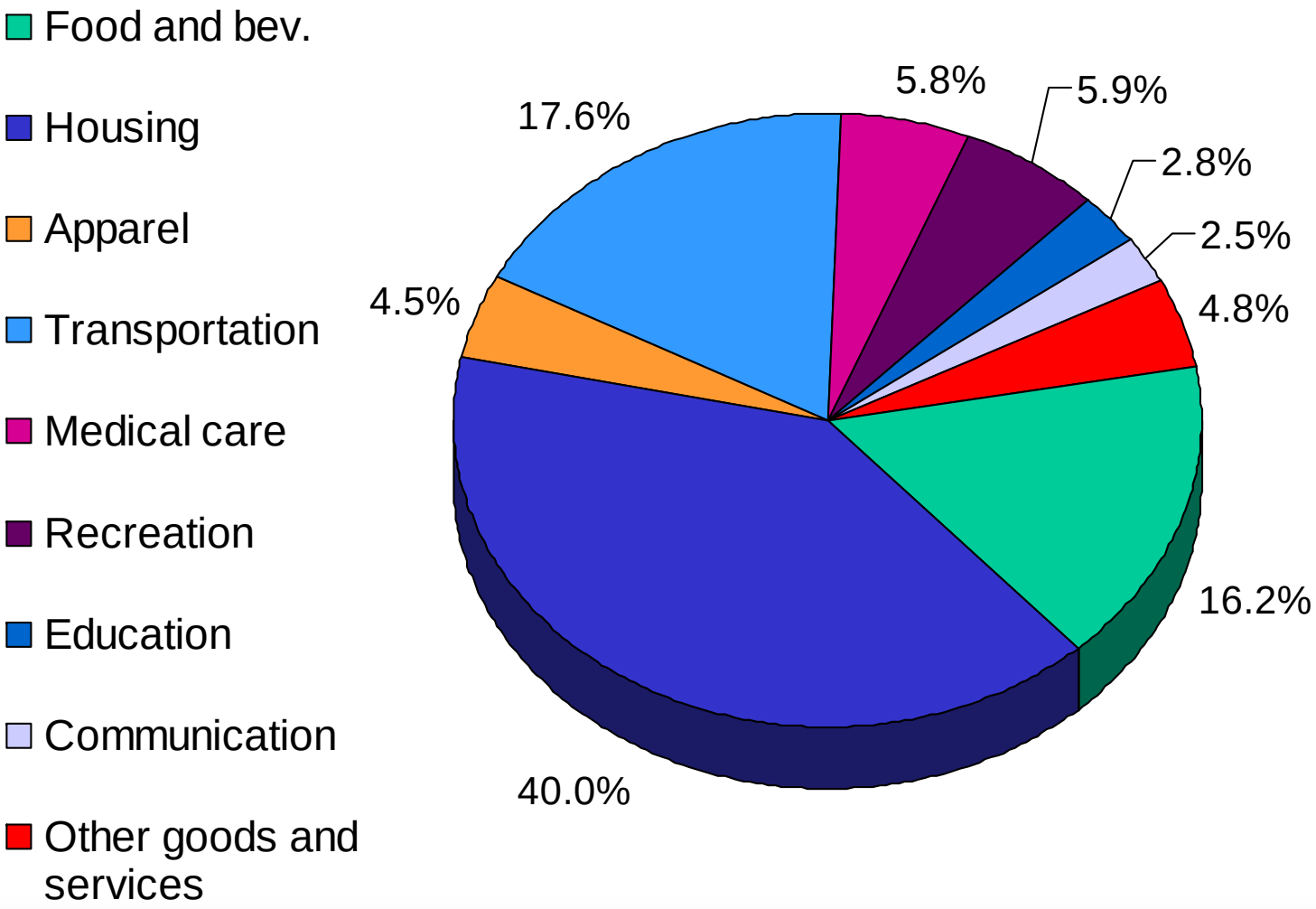
- A measure of the overall level of prices
- Published by the **Bureau of Labor Statistics** (**BLS**)
- Used to
  - track changes in the typical household's cost of living
  - adjust many contracts for inflation (*i.e.* "COLAs")
  - allow comparisons of dollar figures from different years

How the BLS constructs the CPI

1. Survey consumers to determine composition of the typical consumer's "basket" of goods.
2. Every month, collect data on prices of all items in the basket; compute cost of basket
3. CPI in any month equals

$$100 \times \frac{\text{Cost of basket in that month}}{\text{Cost of basket in base period}}$$

The composition of the CPI's "basket"



Understanding the CPI

Example with 3 goods

For good i = 1, 2, 3

C_i = the amount of good i in the CPI's basket

P_{it} = the price of good i in month t

E_t = the cost of the CPI basket in month t

E_b = cost of the basket in the base period

Understanding the CPI

$$\text{CPI in month } t = 100 \times \frac{E_t}{E_b} = 100 \times \frac{P_{1t}C_1 + P_{2t}C_2 + P_{3t}C_3}{E_b}$$

$$= 100 \times \left[\left(\frac{C_1}{E_b} \right) P_{1t} + \left(\frac{C_2}{E_b} \right) P_{2t} + \left(\frac{C_3}{E_b} \right) P_{3t} \right]$$

The CPI is a weighted average of prices.

The weight on each price reflects that good's relative importance in the CPI's basket.

Note that the weights remain fixed over time.

Reasons why the CPI may overstate inflation

- **Substitution bias**: The CPI uses fixed weights, so it cannot reflect consumers' ability to substitute toward goods whose relative prices have fallen.
- **Introduction of new goods**: The introduction of new goods makes consumers better off and, in effect, increases the real value of the dollar. But it does not reduce the CPI, because the CPI uses fixed weights.
- **Unmeasured changes in quality**: Quality improvements increase the value of the dollar, but are often not fully measured.

The CPI's bias

- The Boskin Panel's "best estimate": The CPI overstates the true increase in the cost of living by 1.1% per year.
- Result: the BLS has refined the way it calculates the CPI to reduce the bias.
- It is now believed that the CPI's bias is slightly less than 1% per year.

NOW YOU TRY

Discussion Questions

1. If your grandmother receives Social Security, how is she affected by the CPI's bias?
2. Where does the government get the money to pay COLAs to Social Security recipients?
3. If you pay income and Social Security taxes, how does the CPI's bias affect you?
4. Is the government giving your grandmother too much of a COLA?
5. How does your grandmother's "basket" differ from the CPI's? Does this affect your answer to Q4?

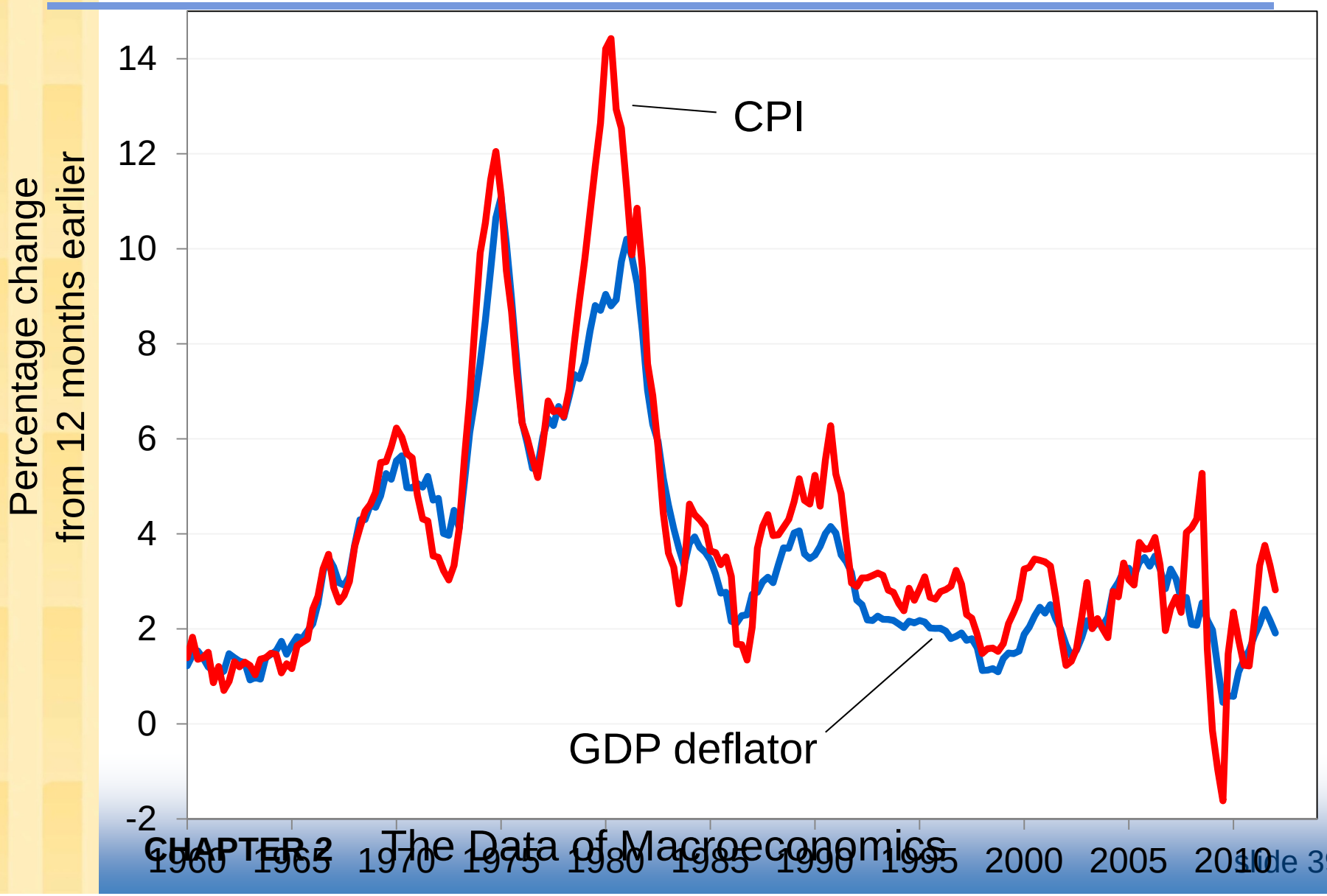
CPI vs. GDP deflator

prices of capital goods
- included in GDP deflator (if produced domestically)
- excluded from CPI

prices of imported consumer goods
- included in CPI
- excluded from GDP deflator

the basket of goods
- CPI: fixed
- GDP deflator: changes every year

Two measures of inflation in the U.S.



Measuring Unemployment: Categories of the population

- ***employed***
  working at a paid job
- ***unemployed***
  not employed but looking for a job
- ***labor force***
  the amount of labor available for producing goods and services; all employed plus unemployed persons
- ***not in the labor force***
  not employed, not looking for work.

Two important labor force concepts

- ***unemployment rate***
  percentage of the labor force that is unemployed
- ***labor force participation rate***
  the fraction of the adult population that 'participates' in the labor force

Compute percentage changes in labor force statistics

Suppose

- the population increases by 1%
- the labor force increases by 3%
- the number of unemployed persons increases by 2%

Compute the percentage changes in

the labor force participation rate: **2%**

the unemployment rate: **–1%**

Okun's Law (Observation)

- Employed workers help produce GDP, while unemployed workers do not. So one would expect a negative relationship between unemployment and real GDP.
- This relationship is clear in the data...

Okun's Law

Okun's Law states that a one-percent decrease in unemployment is associated with two percentage points of additional growth in real GDP