



Chapter 2:

The Data of Macroeconomics



Where can we find data?

- For the United States, go to the website of *Federal Reserve Bank of St. Louis*:

<http://research.stlouisfed.org/fred2/>

- For China, go to 中华人民共和国国家统计局

<http://www.stats.gov.cn/tjsj/>

or *Federal Reserve Bank of Atlanta*:

<https://www.frbatlanta.org/cqer/research/china-macroeconomy.aspx?panel=1>



IN THIS CHAPTER, YOU WILL LEARN:

... the meaning and measurement of the most important macroeconomic statistics:

- gross domestic product (GDP)
(国内生产总值)
- the consumer price index (CPI)
(消费价格指数)
- the unemployment rate
(失业率)



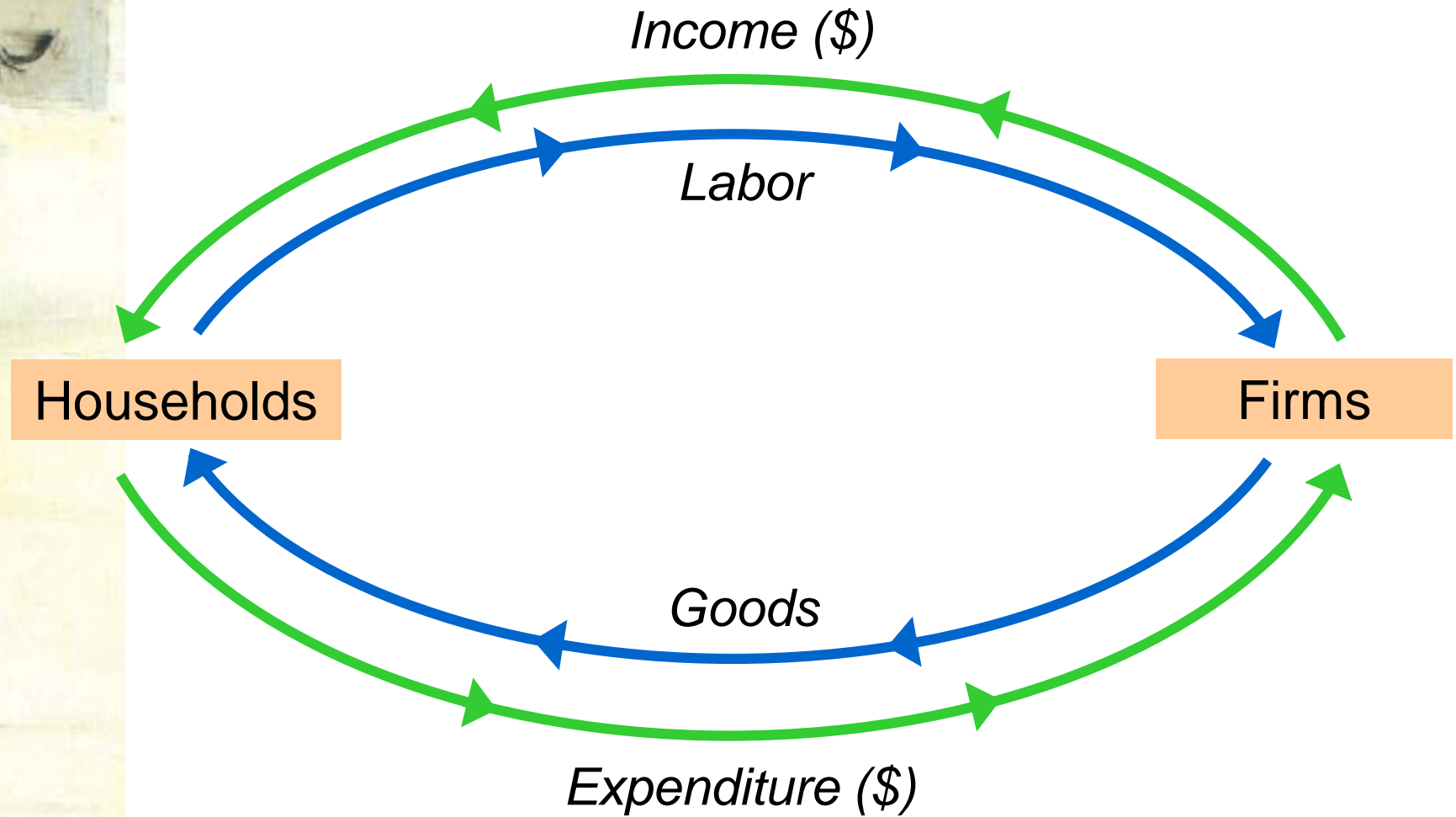
Gross Domestic Product: Expenditure and Income

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 Circular Flow





Value added (增加值)

Value added: The value of output minus the value of the intermediate goods used to produce that output.



Final goods, value added, and GDP

- GDP = value of final goods produced
= sum of value added at all
stages of production
- Why “final” good?
 - Because the value of the final goods already includes the value of the intermediate goods, so including intermediate goods in GDP would be double-counting.

NOW YOU TRY

Identifying value added

- A farmer grows a bushel of wheat and sells it to a miller for \$1.00.
- The miller turns the wheat into flour and sells it to a baker for \$3.00.
- The baker uses the flour to make a loaf of bread and sells it to an engineer for \$6.00.
- The engineer eats the bread.
value added at each stage of production
(\$1, \$3-\$1=\$2, \$6-\$3=\$3)
– *GDP=value of final good=\$6*
=sum of value-added at all stages of production=\$1+\$2+\$3=\$6




Something to note

- The sale of used good is not included.
(GDP measures the value of *currently* produced goods and services.)
- The imputed value of housing services enjoyed by homeowners is included.
- Home production is not included.
(ex. Suppose Jack marries his barber Rose. GDP decreases.)
- Goods and services sold in the underground economy (地下经济) is not included.



The expenditure components of GDP

- consumption
- investment
- government spending
- net exports



National income accounts identity (国民收入核算恒等式)

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

***Value of total output =
aggregate expenditure***

Y: GDP

C: consumption (消费)

I: investment (投资)

G: government expending (purchases)
(政府购买)

NX: net exports (净出口)

Consumption (C)

Definition: The value of all goods and services bought by *households*. Includes:



- **Durable goods** (耐用品) last a long time. *E.g.*, cars, home appliances
- **Nondurable goods** (非耐用品) last a short time. *E.g.*, food, clothing
- **Services** (服务) are intangible items purchased by consumers. *E.g.*, dry cleaning, air travel



U.S. Consumption, 2014

	<i>\$ billions</i>	<i>% of GDP</i>
Consumption	12,002	68.2
Durables	1,320	7.5
Nondurables	2,691	15.3
Services	7,990	45.4



Investment (I)

- Spending on capital, a physical asset used in future production
- Includes:
 - **Business fixed investment** (企业固定资产投资)
Spending on plant and equipment
 - **Residential fixed investment**
(住房固定资产投资)
Spending by consumers and landlords on housing units
 - **Inventory investment** (存货投资)
The change in the value of all firms' inventories



U.S. Investment, 2014

	<i>\$ billions</i>	<i>% of GDP</i>
Investment	2,905	16.5
Business fixed	2,244	12.8
Residential	566	3.2
Inventory	94	0.5



Investment (投资) ? ? ?

- Capital is one of the factors of production.
- Investment is spending on new capital and goods bought for future use.

Ex.

- 1. Gates buys \$5 million in IBM stock from Buffett on the New York Stock Exchange.
- 2. General motor sells \$10 million in stock to the public and uses the proceeds to build a new car factory.

Stocks (存量) vs. Flows (流量)

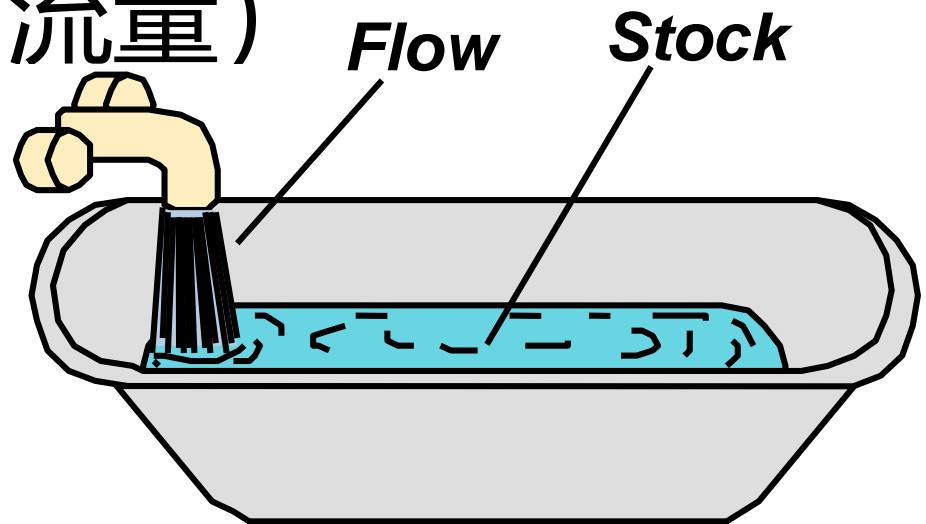
A **stock** is a quantity measured at a point in time.

E.g.,

“The U.S. capital stock was \$10 trillion on January 1, 2016.”

A **flow** is a quantity measured per unit of time.

E.g., “U.S. investment was \$2 trillion during 2016.”





Stocks vs. Flows: Examples

<i>Stock</i>	<i>Flow</i>
a person's wealth	a person's annual savings
# of people with college degrees	# of new college graduates this year
the govt debt	the govt budget deficit

NOW YOU TRY

Stock or Flow?

- The balance on your credit card statement
- How much time you spend studying
- The size of your MP3/iTunes collection
- The inflation rate
- The unemployment rate



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.

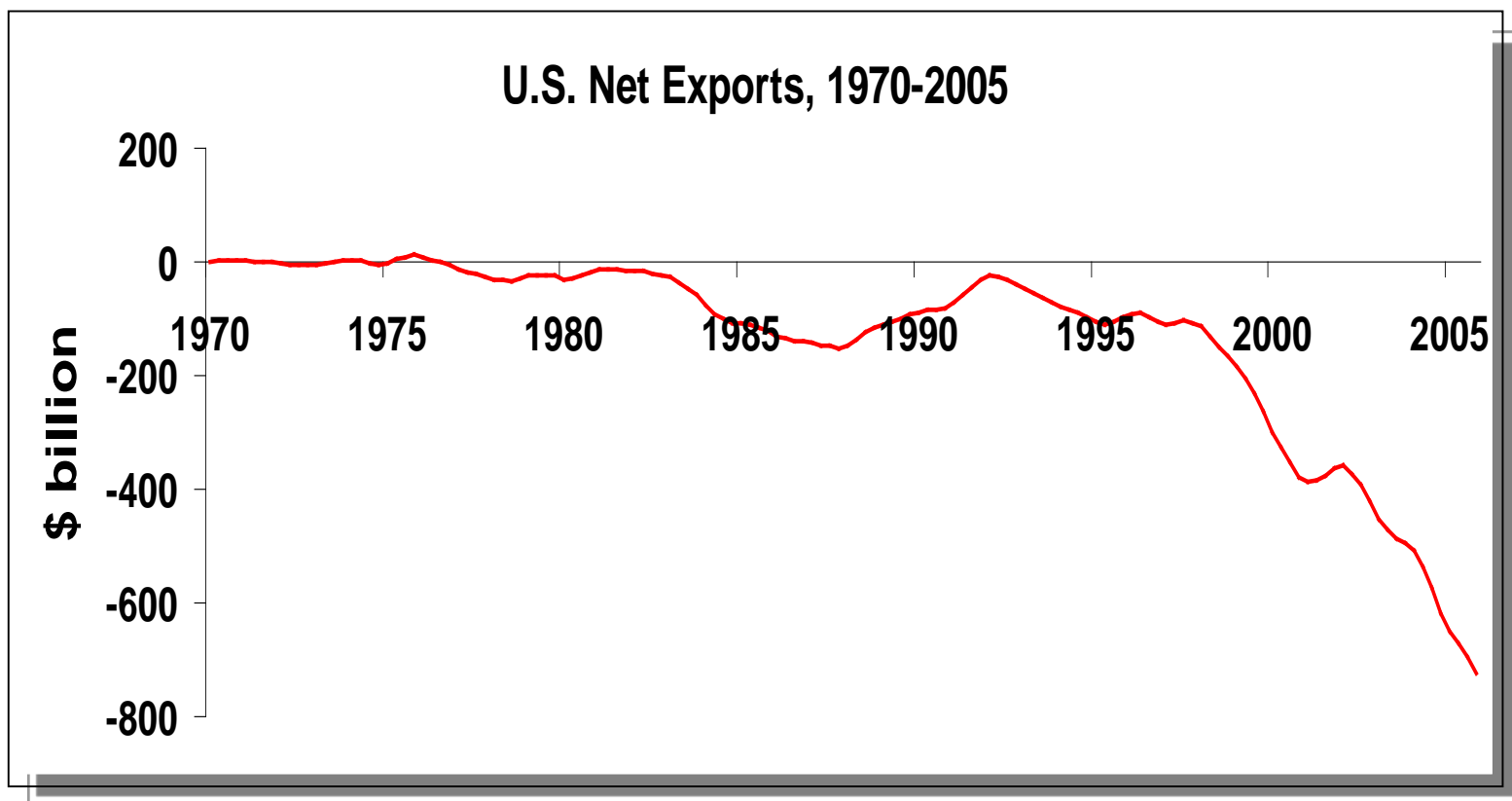


U.S. Government Spending, 2014

	\$ billions	% of GDP
Govt spending	3,209	18.2
- Federal	1,241	7.1
Nondefense	457	2.6
Defense	784	4.5
- State & local	1,968	11.2

Net exports ($NX = EX - IM$)

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





U.S. Net Exports, 2014

	\$ billions	% of GDP
Net exports of g&s	−517	−2.9
Exports	2,367	13.4
Goods	1,645	9.3
Services	721	4.1
Imports	2,883	16.4
Goods	2,394	13.6
Services	489	2.8

NOW YOU TRY

An expenditure-output puzzle?

Suppose a firm:

- produces \$10 million worth of final goods
- 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 or not the inventory buildup was intentional.
- 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 (国民生产总值)

vs. GDP (国内生产总值)

- **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.

$$\text{GNP} - \text{GDP} = \text{factor payments from abroad} \\ \text{minus factor payments to abroad}$$

- Examples of factor payments: wages, profits, rent, interest & dividends on assets

NOW YOU TRY


Discussion Question

*In your country,
which would you
want to be bigger,
GDP or GNP?
Why?*

GNP vs. GDP in Select Countries, 2012

<i>Country</i>	<i>GNP</i>	<i>GDP</i>	<i>GNP – GDP (% of GDP)</i>
Bangladesh	127,672	116,355	9.7
Japan	6,150,132	5,961,066	3.2
China	8,184,963	8,227,103	-0.5
United States	16,514,500	16,244,600	1.7
India	1,837,279	1,858,740	-1.2
Canada	1,821,424	1,779,635	2.3
Greece	250,167	248,939	0.5
Iraq	216,453	215,838	0.3
Ireland	171,996	210,636	-18.3

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



Real (实际) vs. nominal (名义) GDP

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

.

NOW YOU TRY

Real and nominal GDP

	2010		2011		2012	
	P	Q	P	Q	P	Q
good A	\$30	900	\$31	1,000	\$36	1,050
good B	\$100	192	\$102	200	\$100	205

- Compute nominal GDP in each year.
- Compute real GDP in each year using 2010 as the base year.

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Answers

Nominal GDP *multiply Ps & Qs from same year*

$$2010: \$46,200 = \$30 \times 900 + \$100 \times 192$$

$$2011: \$51,400$$

$$2012: \$58,300$$

Real GDP *multiply each year's Qs by 2010 Ps*

$$2010: \$46,200$$

$$2011: \$50,000$$

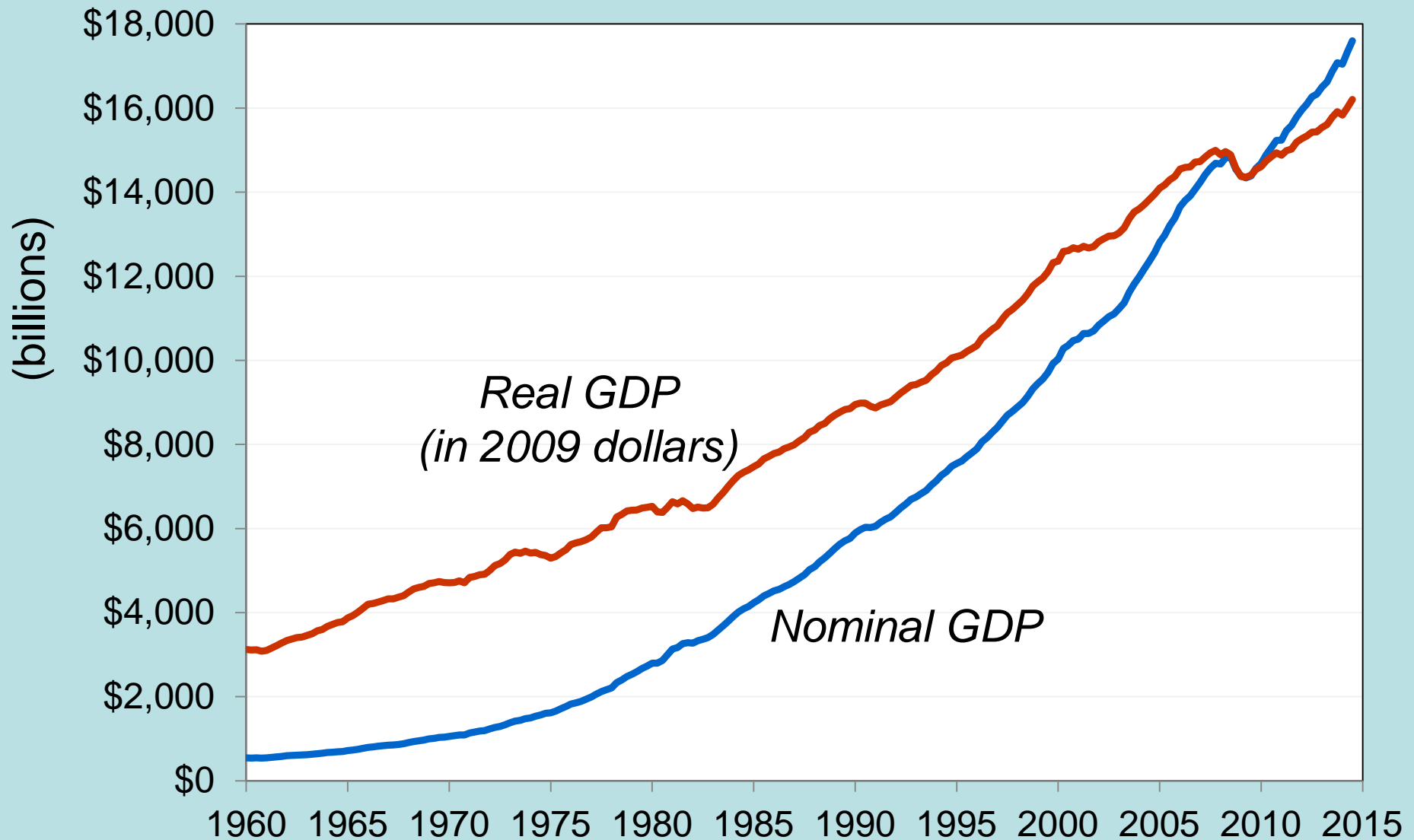
$$2012: \$52,000 = \$30 \times 1050 + \$100 \times 205$$



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.

U.S. Nominal and Real GDP, 1960-2014





GDP deflator (GDP平減指数)

- **Inflation rate**: the percentage increase in the overall level of prices.
- One measure of the price level: **GDP deflator**

Definition:

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

NOW YOU TRY

GDP deflator and the inflation rate

	Nom. GDP	Real GDP	GDP deflator	Inflation rate
2010	\$46,200	\$46,200		<i>n.a.</i>
2011	51,400	50,000		
2012	58,300	52,000		




- Use your previous answers to compute the GDP deflator in each year.
- Use GDP deflator to compute the inflation rate from 2010 to 2011 and from 2011 to 2012.

NOW YOU TRY

Answers

	Nom. GDP	Real GDP	GDP deflator	Inflation rate
2010	\$46,200	\$46,200	100.0	<i>n.a.</i>
2011	51,400	50,000	102.8	2.8%
2012	58,300	52,000	112.1	9.1%



Two arithmetic tricks for working with percentage changes

1. For any variables X and Y ,
percentage change in $(X \times Y)$
 \approx percentage change in X
+ percentage change in Y

Ex.: If your hourly wage rises 5%
and you work 7% more hours,
then your wage income rises
approximately 12%.



Two arithmetic tricks for working with percentage changes

2. Percentage change in (X/Y)
 \approx percentage change in X
 $-$ percentage change in Y

Ex.: GDP deflator = $100 \times \text{NGDP}/\text{RGDP}$.

If NGDP rises 9% and RGDP rises 4%,

then the inflation rate is approximately 5%.



Chain-weighted (环比) real GDP

- Over time, relative prices change, so the base year should be updated periodically.
- In essence, **chain-weighted real GDP** updates the base year every year, so it is more accurate than constant-price GDP.
- Your textbook usually uses constant-price real GDP because:
 - the two measures are highly correlated
 - constant-price real GDP is easier to compute



Consumer price index (CPI)

- A measure of the overall level of prices
- Published by the Bureau of Labor Statistics (BLS)
- Uses:
 - tracks changes in the typical household's cost of living
 - adjusts many contracts for inflation (“COLAs”)
 - allows comparisons of dollar amounts over time



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

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

NOW YOU TRY

Compute the CPI

Basket: 20 pizzas, 10 compact discs

Prices:

	pizza	CDs
2012	\$10	\$15
2013	11	15
2014	12	16
2015	13	15

For each year, compute:

- the cost of the basket
- the CPI (use 2012 as the base year)
- the inflation rate from the preceding year

NOW YOU TRY

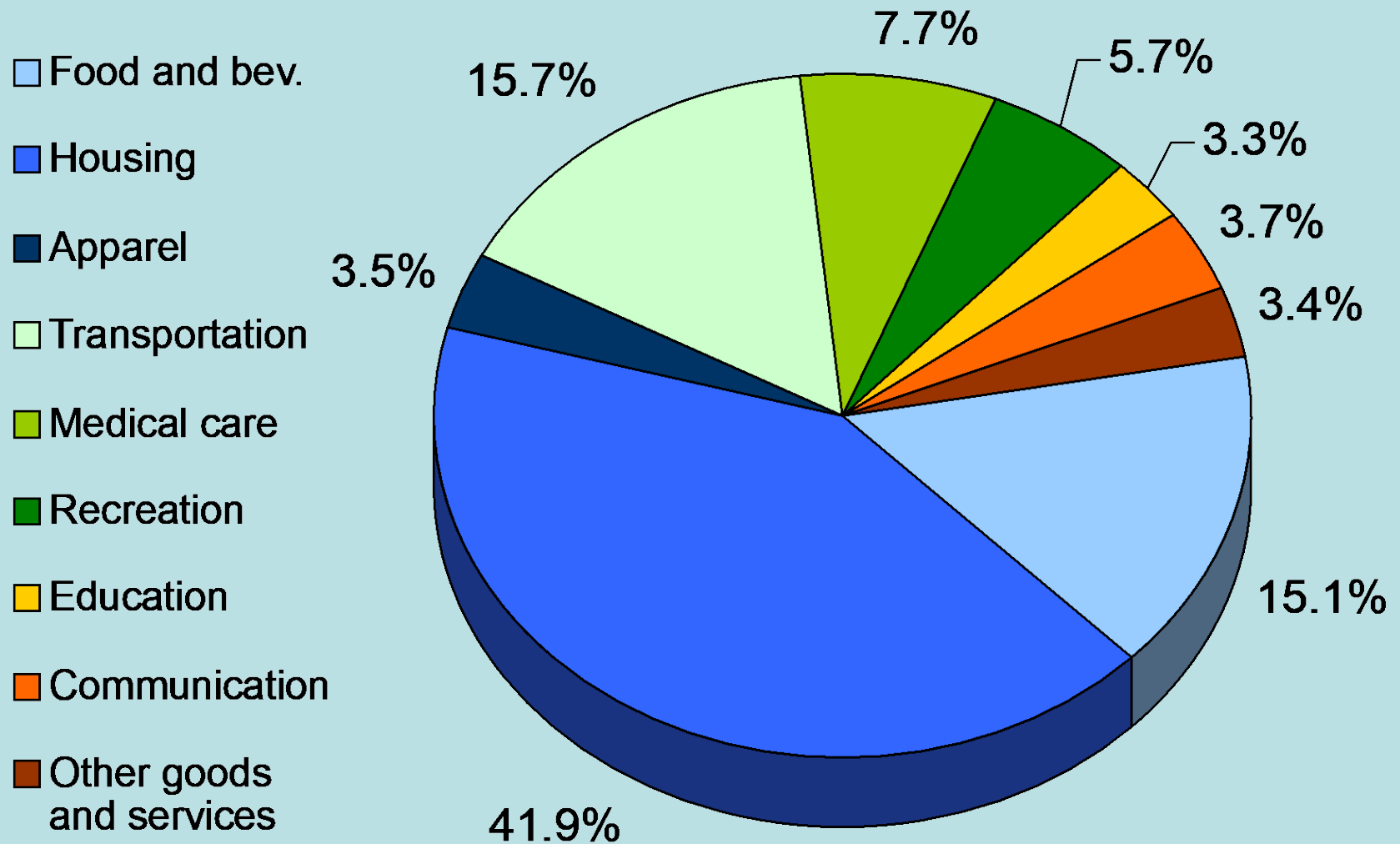
Answers

	Cost of basket	CPI	Inflation rate
2012	\$350	100.0	<i>n.a.</i>
2013	370	105.7	5.7%
2014	400	114.3	8.1%
2015	410	117.1	2.5%

The diagram illustrates the calculation of the inflation rate for each year from 2013 to 2015. It uses colored lines to connect the CPI values of consecutive years to the inflation rate for that year:

- A green line connects the 2012 CPI (100.0) to the 2013 inflation rate (5.7%).
- A red line connects the 2013 CPI (105.7) to the 2014 inflation rate (8.1%).
- A purple line connects the 2014 CPI (114.3) to the 2015 inflation rate (2.5%).

The composition of the CPI's "basket"





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.



CPI (消费价格指数)

vs. GDP deflator (GDP平减指数)

- GDP deflator includes all the G & S produced in the economy; CPI only includes a basket of some G & S.
- GDP deflator includes only domestic products; CPI may include imports.
- CPI has a fixed basket, so quantities do not change. Quantities may change in GDP deflator.



Categories of the population: the household survey (家庭调查)

- **Employed**
working at a paid job
- **Unemployed**
not employed but looking for a job
- **Labor force** (劳动力大军)
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**
(劳动参与率)
the fraction of the adult population that “participates” in the labor force, *i.e.* is working or looking for work

NOW YOU TRY

Computing labor statistics

U.S. adult population by group, Dec 2014

Number employed = 147.4 million

Number unemployed = 8.7 million

Adult population = 249.0 million

Calculate

- the labor force
- the unemployment rate
- the labor force participation rate

NOW YOU TRY

Answers

Data: ***E*** = 147.4, ***U*** = 8.7, ***POP*** = 249.0

- Labor force

$$***L*** = ***E*** + ***U*** = 147.4 + 8.7 = 156.1$$

- Unemployment rate

$$***U/L*** \times 100\% = (8.7/156.1) \times 100\% = 5.6\%$$

- Labor force participation rate

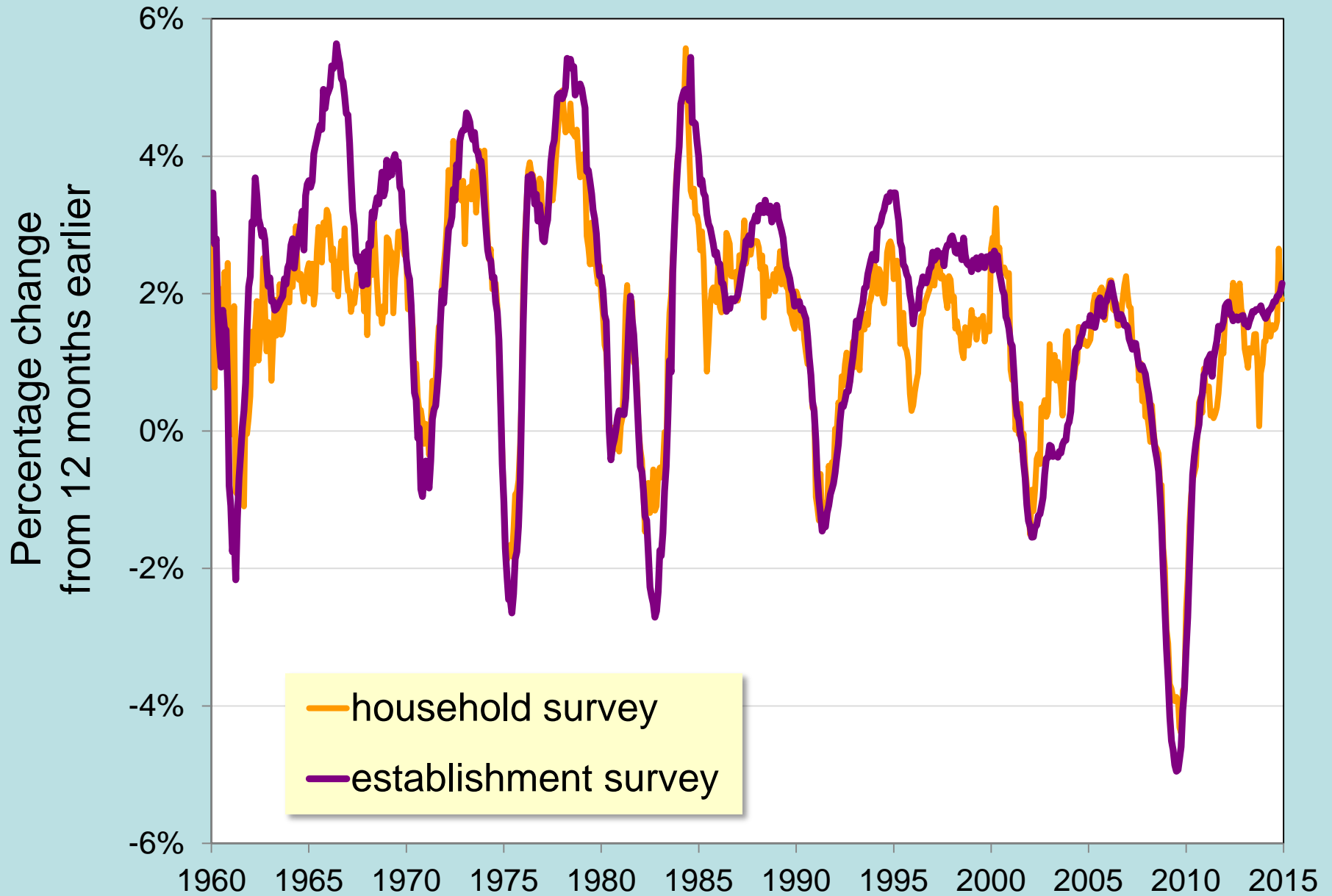
$$***L/POP*** \times 100\% = (156.1/249.0) \times 100\% = 62.7\%$$



The establishment survey (机构调查)

- The BLS obtains a second measure of employment by surveying businesses, asking how many workers are on their payrolls.
- Neither measure is perfect, and they occasionally diverge due to:
 - treatment of self-employed persons
 - new firms not counted in establishment survey
 - technical issues involving population inferences from sample data

Two measures of employment growth





CHAPTER SUMMARY

- Gross domestic product (GDP) measures both total income and total expenditure on the economy's output of goods & services.
- Nominal GDP values output at current prices; real GDP values output at constant prices. Changes in output affect both measures, but changes in prices only affect nominal GDP.
- GDP is the sum of consumption, investment, government purchases, and net exports.



CHAPTER SUMMARY

- The overall level of prices can be measured by either:
 - the consumer price index (CPI), the price of a fixed basket of goods purchased by the typical consumer, or
 - the GDP deflator, the ratio of nominal to real GDP.
- The unemployment rate is the fraction of the labor force that is not employed.