ECON 202 - MACROECONOMIC PRINCIPLES

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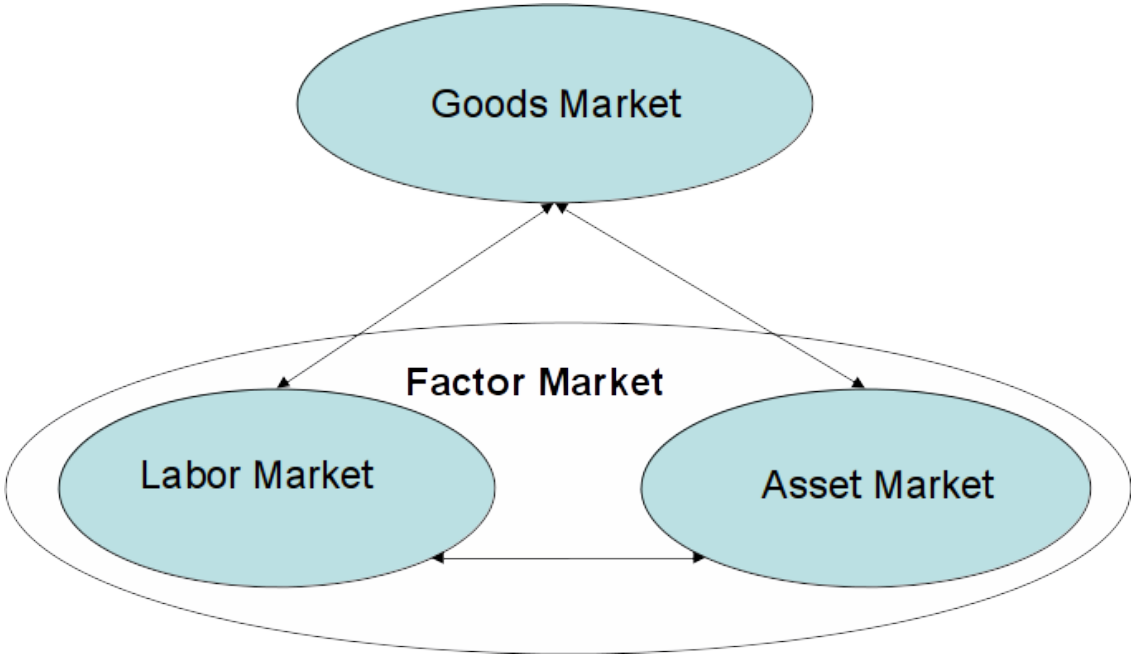
Chapter 5 - Measuring National Production

Measuring National Production - Topics

1. What is an economy in macro?
2. Definitions of GDP
3. How to calculate GDP - 3 approaches
4. Real vs. nominal GDP
5. GDP deflator
6. Consumer price index

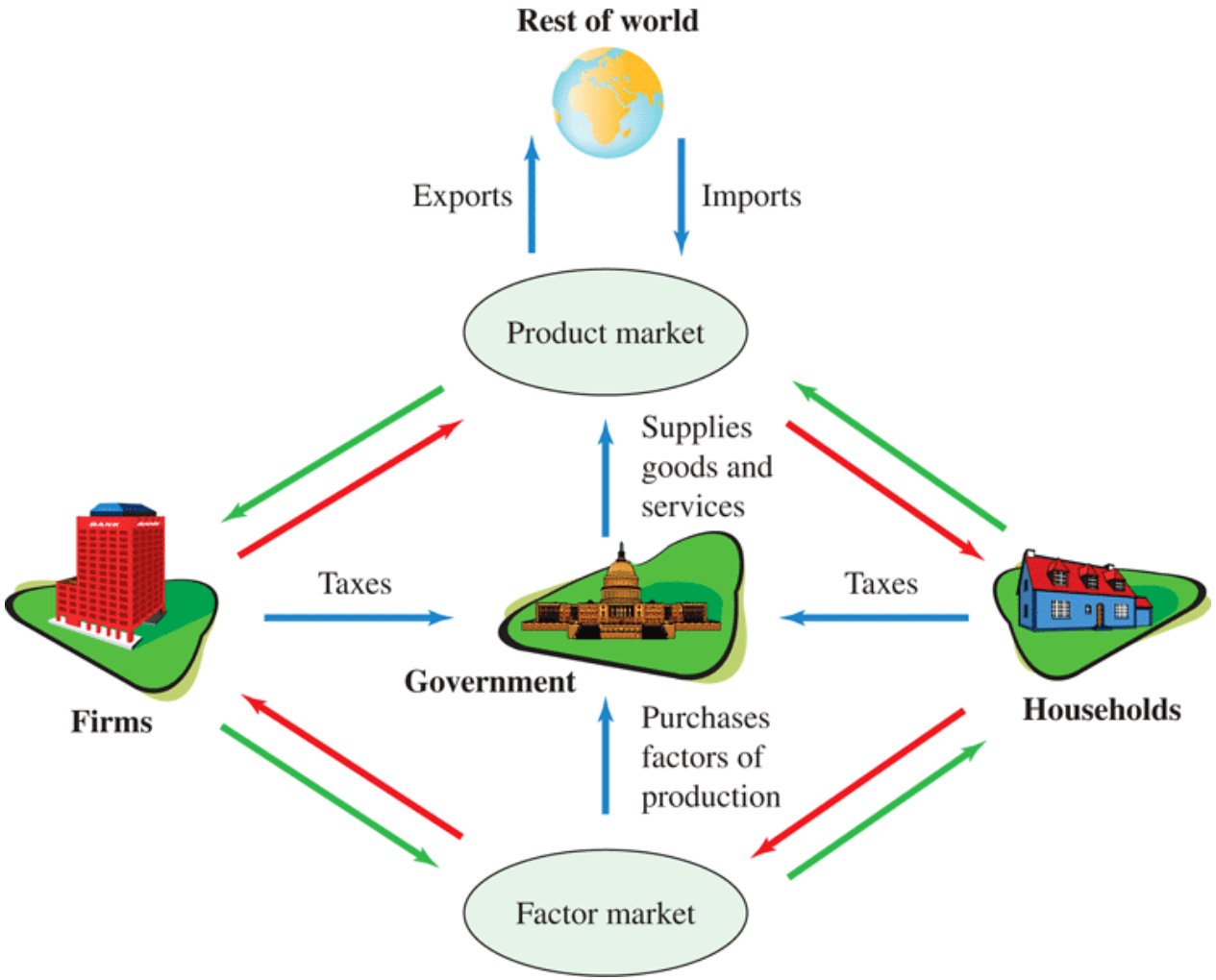
The Economy

Figure 1: The Locations



Circular Flow of Production and Income

Figure 2: Circular Flow



Measuring GDP

How do we measure production?

- Answer: Gross Domestic Product (GDP)
- Definition of GDP
  - The total market value of
  - all the final goods and services
  - produced within an economy
  - in a given year
- It is a measure of total value added to the economy over the given period
- Beware of intermediate goods and stuff produced by Americans outside the states

Three Approaches

- In the United States (US) measured quarterly as part of **National Income and Product Accounts** (NIPA).
- Three approaches:

1. Product - sum of all the value-added in the economy (do not count intermediate goods).
2. Expenditure - total spending on all final goods and services in the economy (do not count intermediate goods).
3. Income - add up all incomes received by economic agents contribution to production.

- All three approaches will yield the same answer:

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

Components of GDP - Expenditure Approach (II)

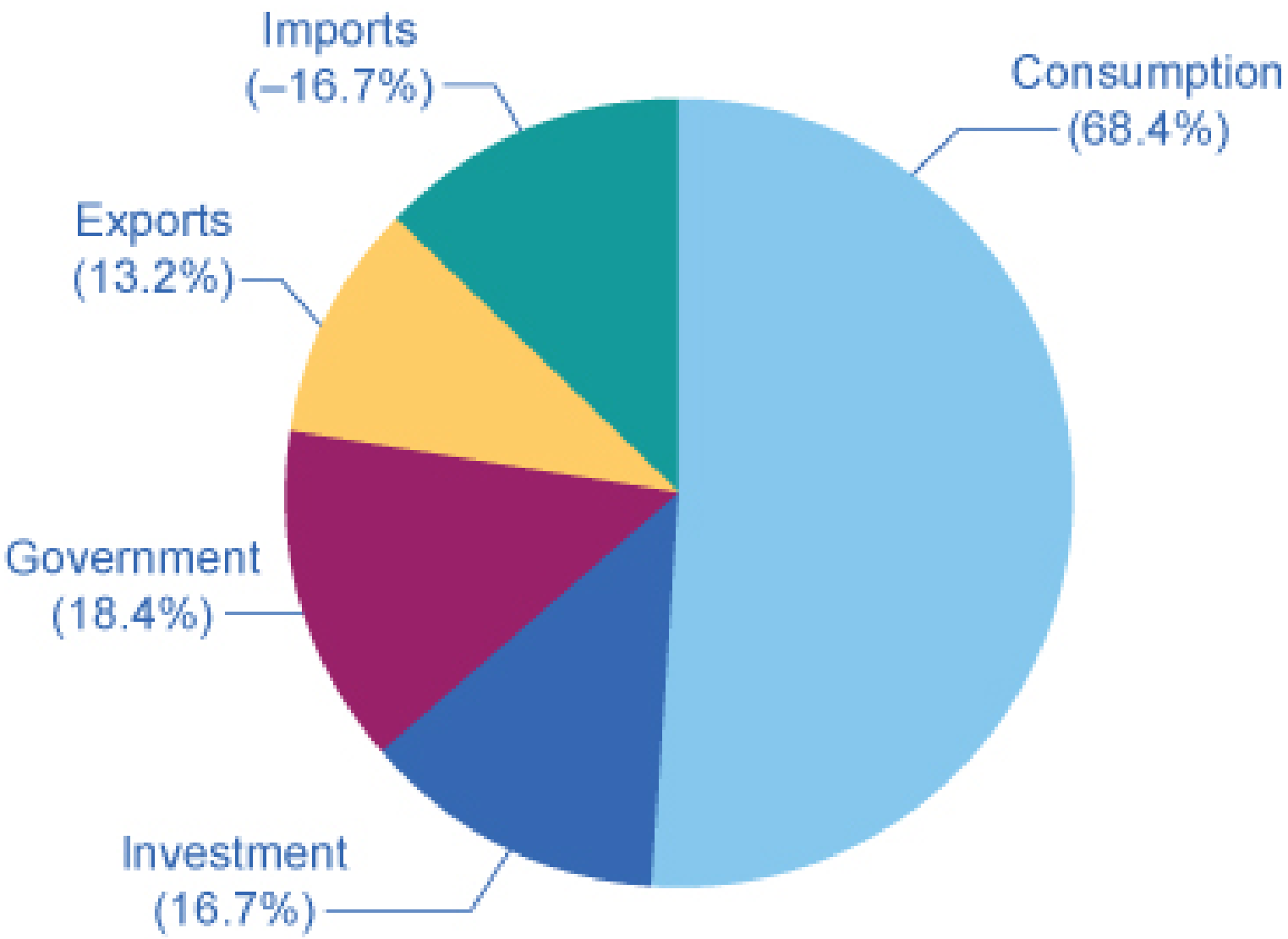
TABLE 5.1 Composition of U.S. GDP, Third Quarter 2011 (Billions of Dollars Expressed at Annual Rates)

GDP	Consumption Expenditures	Private Investment Expenditures	Government Purchases	Net Exports
$15,176	$10,784	$1,906	$3,047	–$562

Components of GDP - Updated (2015)

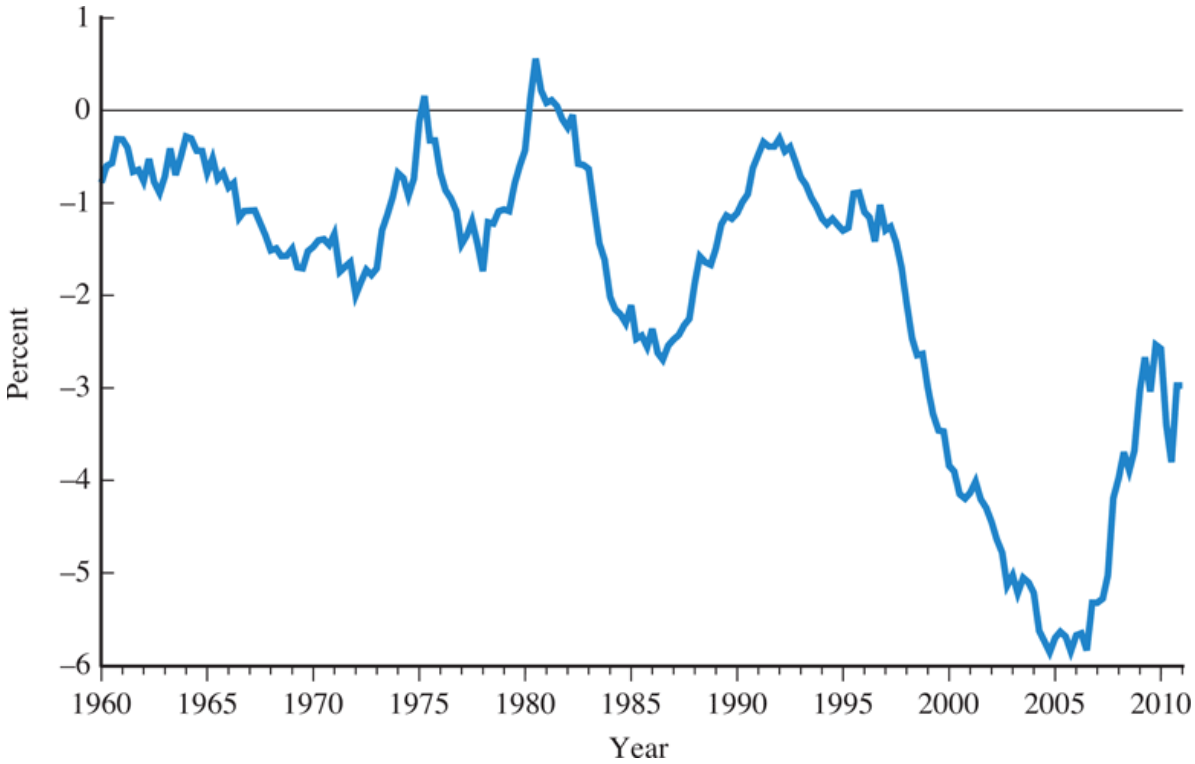
GDP	C	I	G	NX
$18,000	$12,300	$3,000	$3,312	-$630

Components of GDP (2014)



US Trade Balance as Share of GDP

- As a Share of GDP 1960-2011 Prior to the mid-1970s, the United States usually ran a trade surplus with other nations
- However, in recent years, the trade deficits are now the norm for the United States



The Income Approach (III): Measuring a Nation's Macroeconomic Activity Using National Income

TABLE 5.2 From GDP to National Income, Third Quarter 2011 (Billions of Dollars)	
Gross domestic product	$15,176
Gross national product	15,443
Net national product	13,480
National income	13,431

Calculating GDP

- Take all final goods satisfying the definition
- value them at their current market prices and
- add up the total:

$$GDP = P_1 \times Q_1 + ... + P_n \times Q_n$$

Example 1: Simple GDP Calculation

- Imagine that, during the year, only three goods are produced:
  - 10,000 computers at $1000 a piece
  - 2,000 automobiles at $5000 a piece
  - 1,000,000 haircuts at $10 a cut

Example 2: Calculating GDP

Economy 2:

- iron ore producer
  - steel producer
  - car producer
- Iron is an input into steel production
- Steel is an input in car production

Example 2: Calculating GDP (cont.)

Total spending on domestically produced final goods and services = $21,500

	American Ore, Inc.	American Steel, Inc.	American Motors, Inc.	Total factor income
Value of sales	$4,200 (ore)	$9,000 (steel)	$21,500 (car)	
Intermediate goods	0	4,200 (iron ore)	9,000 (steel)	
Wages	2,000	3,700	10,000	$15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure by firm	4,200	9,000	21,500	
Value added per firm = Value of sales – cost of intermediate goods	4,200	4,800	12,500	

Total payments to factors = $21,500

Sum of value added = $21,500

Example 3: Calculating GDP with 3 Approaches

Economy 3:

- Coconut producer produces 10 million coconuts
- Sell for $2.00 each
- Producer pays wages and taxes
- Of the 10 million coconuts, 6 million go to restaurant and 4 million are consumed directly by consumers
- Restaurant pays wages and taxes and sells $30 million in restaurant meals
- Government collects taxes and provides national defense

Example 3: Calculating GDP with 3 Approaches (cont.)

Table 2.1 Coconut Producer

Total Revenue	$20 million
Wages	$5 million
Interest on Loan	$0.5 million
Taxes	$1.5 million

Table 2.2 Restaurant

Total Revenue	$30 million
Cost of Coconuts	$12 million
Wages	$4 million
Taxes	$3 million

Table 2.3 After-Tax Profits

Coconut Producer	$13 million
Restaurant	$11 million

Table 2.4 Government

Tax Revenue	$5.5 million
Wages	$5.5 million

Table 2.5 Consumers

Wage Income	$14.5 million
Interest Income	$0.5 million
Taxes	$1 million
Profits Distributed to Producers	$24 million

GDP Using the Value Added Approach (I)

Table 2.6 GDP Using the Product Approach

Value added - coconuts	$20 million
Value added - restaurant food	$18 million
Value added - government	$5.5 million
GDP	$43.5 million

GDP Using the Expenditure Approach (II)

Table 2.7 GDP Using the Expenditure Approach

Consumption	$38 million
Investment	0
Government Expenditures	$5.5 million
Net Exports	0
GDP	$43.5 million

GDP Using the Income Approach (III)

Table 2.8 GDP Using the Income Approach

Wage Income	$14.5 million
After-tax profits	$24 million
Interest Income	$0.5 million
Taxes	$4.5 million
GDP	$43.5 million

Extensions

- Production of 13 million coconuts (instead of 10) and storing the additional 3 million Distribution of wealth/income is also not considered
- Restaurant imports 2 million coconuts from other islands for $2.00 each and all of the coconuts are used in the Restaurant

Problems with Measuring GDP

Problems with measuring GDP

- Economic activity in the underground economy cannot be measured directly
- It might be measured indirectly by accounting for the use of currency

TABLE 5.6 The World Underground Economy, 2002–2003

Region of the World	Underground Economy as Percent of Reported GDP
Africa	41%
Central and South America	41
Asia	30
Transition Economies	38
Europe, United States, and Japan	17
Unweighted Average over 145 Countries	35

Real vs Nominal GDP

Nominal versus Real variables

- Compare a variable like GDP dollar value over time
- However, price levels change (inflation) so must make adjustments
- GDP dollar value change is due to two components:
  - real growth in resources (real change)
  - inflation of the price level (norminal change)
- How to separate out these two components?
  - Construct a price index as a measure of the (average) price level.
  - Calculate inflation rate of this price index
- Use inflation rate to back out real changes in GDP
- Real GDP uses the prices of a base year

Inflation

- A general rise in nominal prices is called inflation
- Define the GDP Deflator as follows:
  - GDP Deflator = Nominal GDP/Real GDP
- If we have the deflator, we can calculate real GDP from nominal GDP
  - Real GDP = Nominal GDP/GDP Deflator
- In general:
  - Real Value = Nominal Value/ Price Index

Alternative Inflation Measures

- Often, we are interested in a measure of inflation that tracks the "cost of living"
- The GDP Deflator may not be precisely suited for this task
- Why?

GDP over Time

Real GDP Growth

- Nominal GDP Growth

$$g_{\text{nom-GDP}} = \frac{\$75{,}000 - \$45{,}000}{\$45{,}000} = 0.667 = 66.7\%$$

- Real GDP Growth

$$g_{\text{real-GDP}} = \frac{\$65{,}000 - \$45{,}000}{\$45{,}000} = 0.444 = 44.4\%$$

Real vs Nominal GDP

- We can measure the change in prices over time using an index number called the GDP deflator
- GDP deflator for 2015:

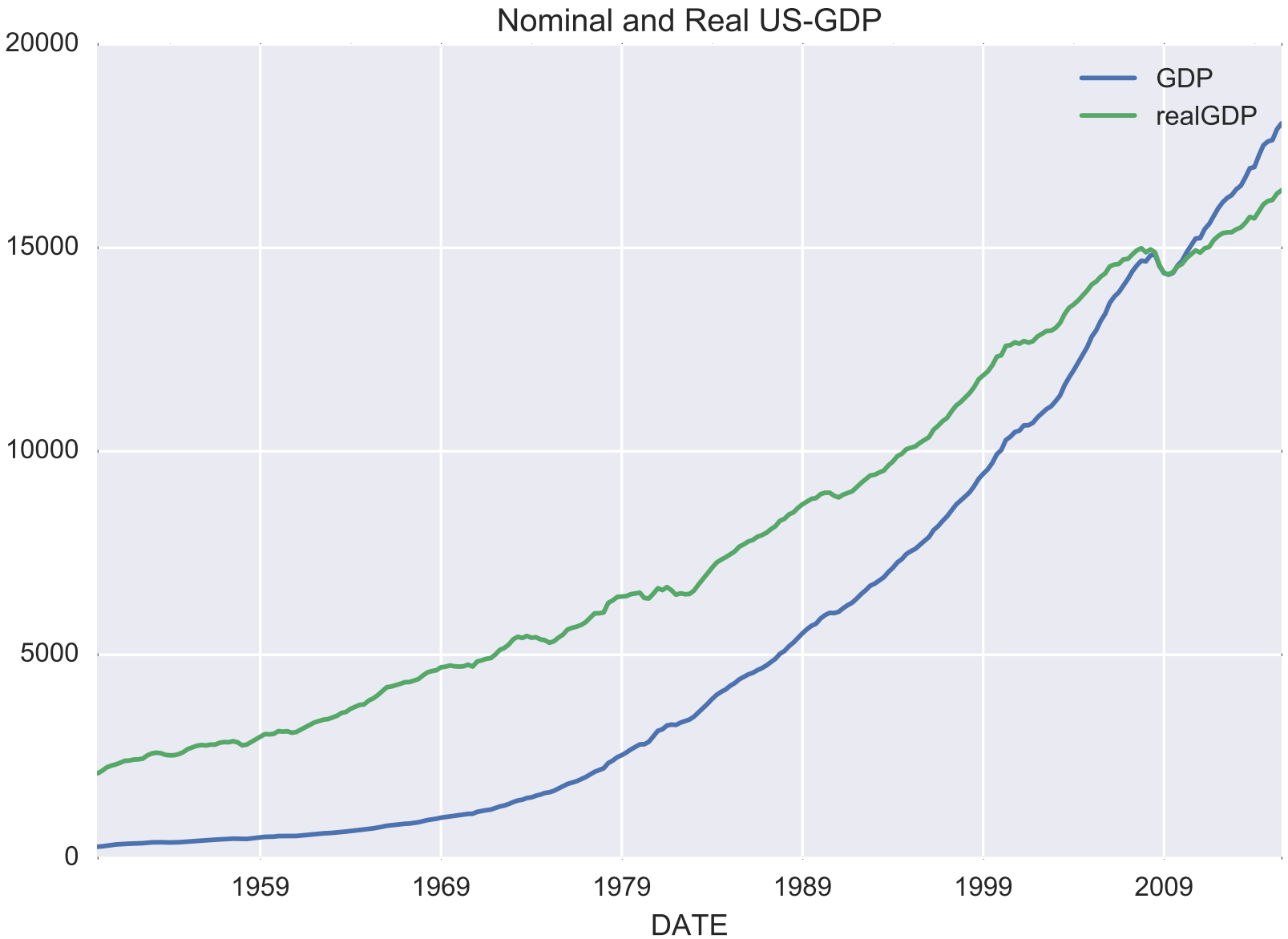
$$\text{GDP-Deflator} = 100 \times \frac{\text{Nominal-GDP in 2015}}{\text{Real-GDP in 2015}}$$

- GDP deflator in example

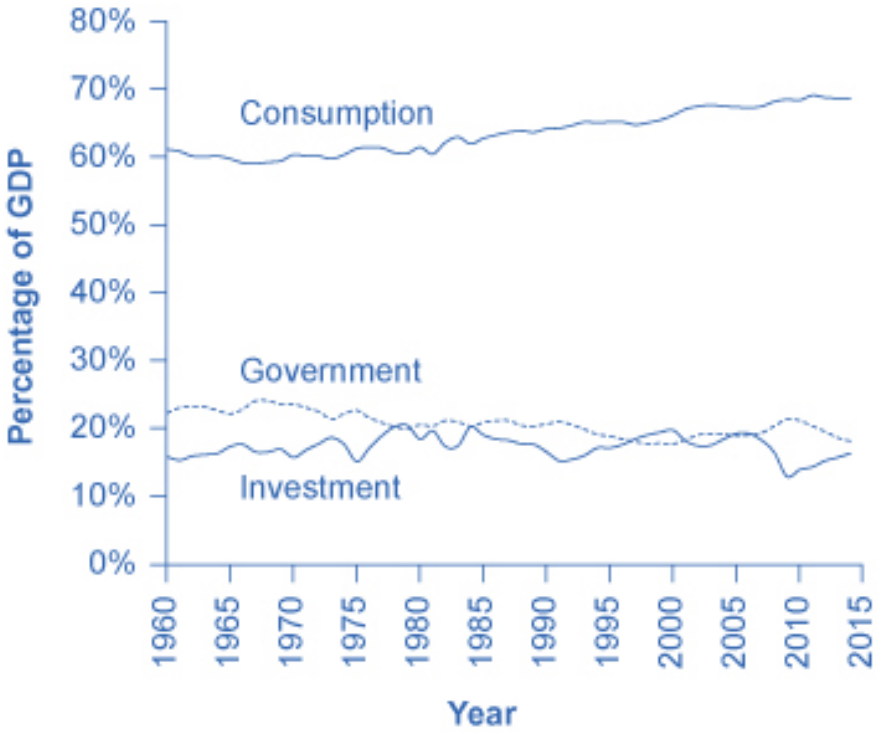
$$\text{GDP-Deflator} - 2015 = 100 \times \frac{\$75,000}{\$65,000} = 115$$

- This means that prices rose by 15% between the two years
- A chain index is a method for calculating price changes based on taking an average of price changes using base years from neighboring years

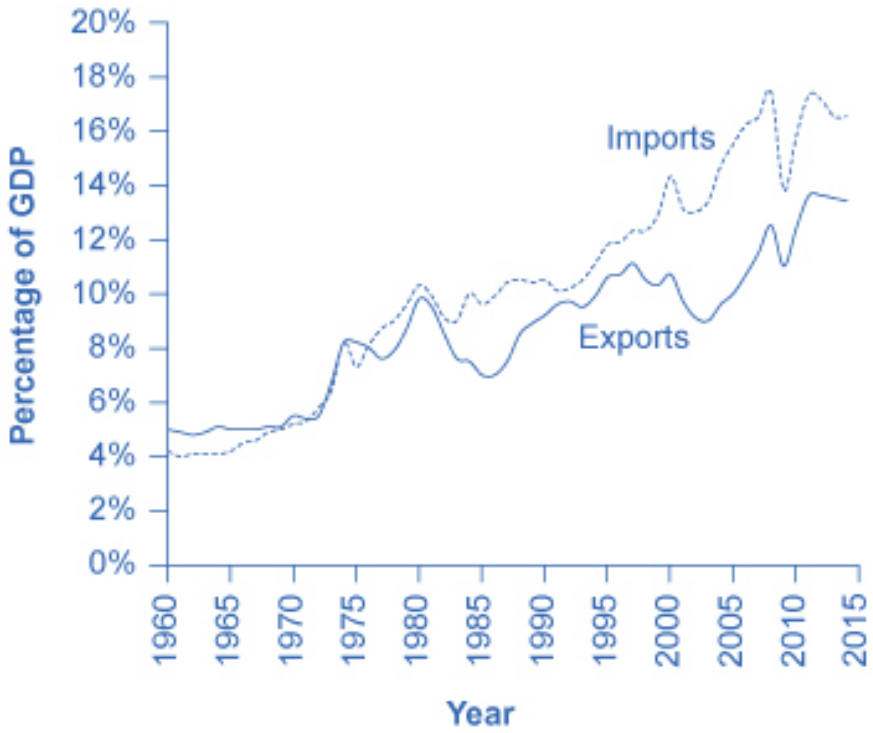
Economic Growth U.S. Real GDP, 1930-2015



Components of GDP over Time

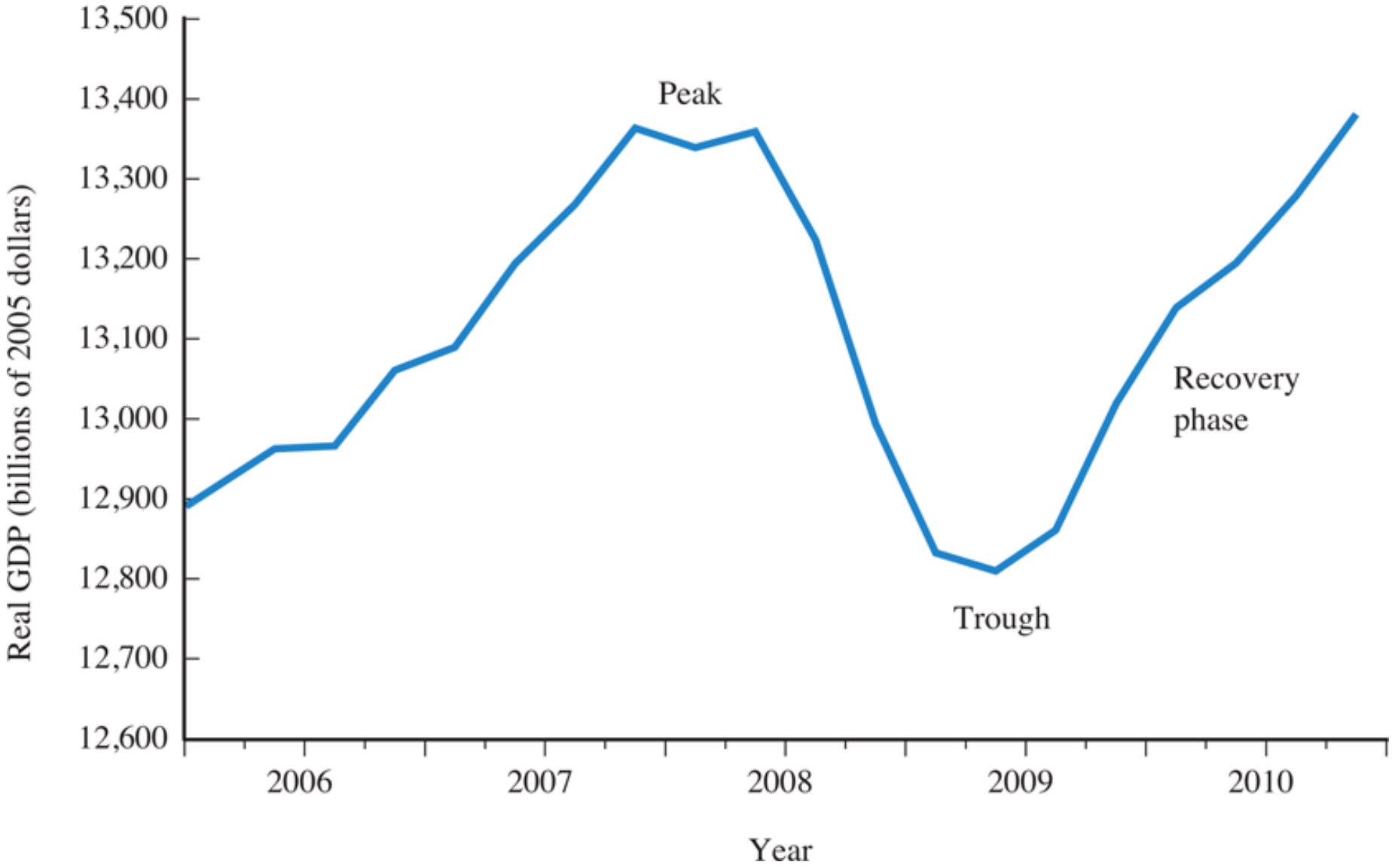


(a) Demand from consumption, investment, and government

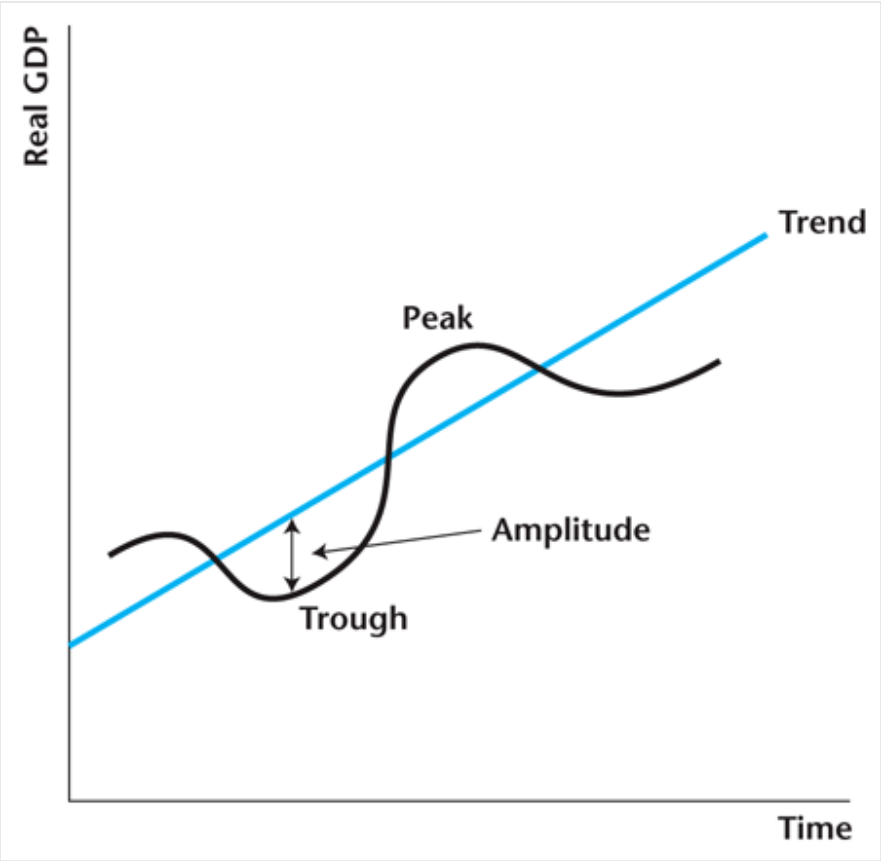


(b) Imports and exports

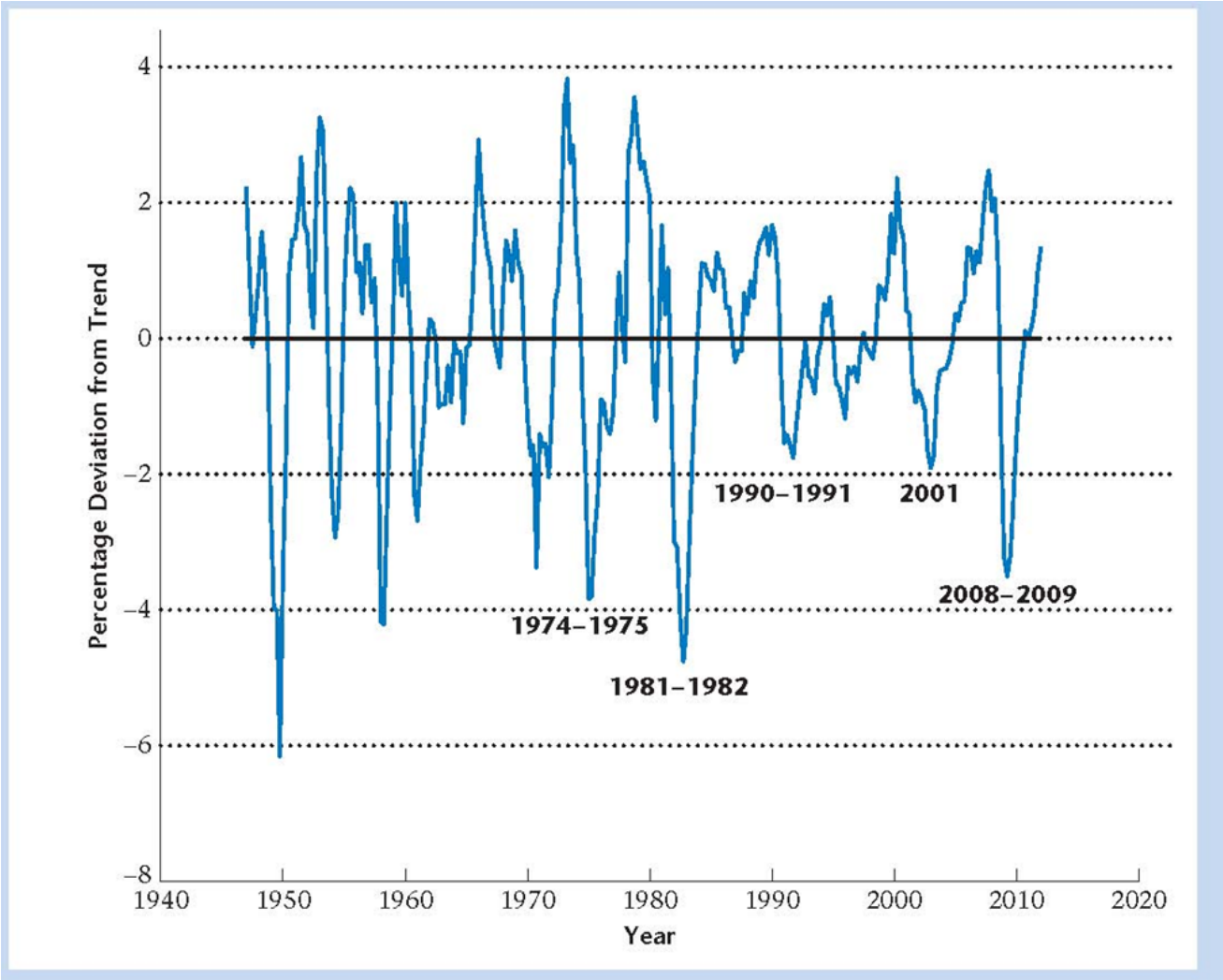
Fluctuations in GDP



Growth and Cycles: Long-Run vs. Short-Run



Percentage Deviations from (Long-Run Growth) Trend



Historical Recessions

1. 1974 – 1975: Oil price shock caused by OPEC restrictions
2. 1981 – 1982: Fight inflation using monetary policy i.e. high interest rates (Volcker rule)
3. 1990 – 1991: Gulf War, oil price high again
4. 2001: Burst of Dot.com bubble and loss of optimism $\rightarrow$ start of housing bubble (Greenspan rule)
5. 2008 – 2009: Burst of Housing bubble and financial crisis

1982 – 2008: The Great Moderation $\rightarrow$ macro aggregates become less volatile

Historical Fluctuations in GDP

TABLE 5.5 Eleven Postwar Recessions

Peak	Trough	Percent Decline in Real GDP	Length of Recession (months)
November 1948	October 1949	–1.5	11
July 1953	May 1954	–3.2	10
August 1957	April 1958	–3.3	8
April 1960	February 1961	–1.2	10
December 1969	November 1970	–1.0	11
November 1973	March 1975	–4.1	16
January 1980	July 1980	–2.5	6
July 1981	November 1982	–3.0	16
July 1990	March 1991	–1.4	8
March 2001	November 2001	–0.6	8
December 2007	June 2009	–4.1	18